

## ONTOLOGY

JEAN-MARC LEPAIN (Vientiane, Laos)

### *THE CONCEPT OF NATURE IN BAHÁ'Í PHILOSOPHY*<sup>1</sup>

Jean-Marc Lepain is an economist who, in a parallel life, pursues a second career in philosophy and Persian studies. He has studied Persian and Arabic at the Institute of Oriental Languages of Paris and at Teheran University just before the Islamic Revolution. He also studied general philosophy at Sorbonne and Islamic philosophy under Henri Corbin, the famous French iranologist. He has written several books and papers in French and prepared a new translation in French of *Some Answered Questions*. His major themes are individualism, rationality, philosophy of science, neuroscience and neurophilosophy, and spirituality. He lives in Laos with his wife and two children.

Bahá'í philosophy, also named Divine Philosophy by 'Abdu'l-Bahá, is called to fulfill an essential role in the intellectual development of the Bahá'í Faith similar to theology in Christianity and Islamic philosophy in Islam. Within Bahá'í philosophy, philosophy of nature occupies a prominent place, as it combines metaphysics with philosophy of science and provides the foundations on which all other branches of Bahá'í philosophy will develop. After defining what philosophy of nature is in relation to philosophy of science and metaphysics, we will show that definitions and functions of nature that can be identified in the Bahá'í writings cannot be understood without reference to what we call the metaphysical framework of Bahá'í philosophy and its accompanying implicit ontology.

#### **1. Philosophy of Nature within the Framework of Bahá'í Philosophy**

We have suggested in some other works that Bahá'í philosophy can be divided into three main branches: (a) the philosophy of the human person (covering topics such as anthropology, psychology, sociology, political science, etc. as well as the principles of our spiritual development); (b) the philosophy of nature (describing both the way in which the cosmos works and its finality and meaning); and (c) the philosophy of divine rev-

---

1. This paper is made of some extracts of a much longer paper entitled "Bahá'í Philosophy of Nature and its Metaphysical Framework."

elation (expressing how God communicates with humankind and how to interpret the Holy Writings).<sup>2</sup> As a consequence, philosophy of nature should be seen as a fundamental constituent of Bahá'í philosophy.

*Philosophy of Nature and Philosophy of Science*

Philosophy of nature plays the same role in Bahá'í philosophy as philosophy of science in the contemporary western philosophic tradition. It is therefore important to understand the differences between the two approaches. Most philosophers of science view their principal activity as the analysis of the method of enquiry used in the various sciences. They assume that science exists as a unified human activity based on a common purpose and an objective method with the aim of providing a comprehensive description of nature. However, they consider the question of why nature operates the way it does as totally irrelevant and unscientific and as having no meaningful answer. This refusal to consider the why-question is what leads to what we call ontological confusion. The why-question can only be answered if we know 'how' things exist. This is what defined modern ontology when applied to philosophy of science or nature. While classical ontology was primarily concerned with the identification of primitive entities in the universe (entities whose existence cannot be explained by other entities), modern ontology considers that all natural objects have ontological dimensions because they have a mode of existence that can be distinct from other objects, as we see in quantum mechanics. This is the reason for which we believe that each field of science must have a distinct ontology, even if these different ontologies ought to be reconciled in a broader metaphysical framework. However, many scientists think that science should only be concerned with a precise description of natural objects and of their properties and eschew the how and why questions. For them, science advances our understanding of nature by formulating theories based on observation and tested through experiment. As a consequence, defining scientific methodology is of paramount importance to philosophers of science as it provides the criteria for distinguishing science from non-science and good science from bad science. Philosophy of science rests on the assumption that science can be unified under one single methodology and that objective criteria capable of defining that methodology exist. The metaphysical assumption that underpins that view is that nature is continuous and homogeneous and that objects that are investigated by the different fields of science are relatively similar. Additionally, most philosophers of science operate within a larger philosophical framework, namely the naturalist framework. Natu-

---

2. Lepain, *Tractatus: A Logical Introduction to Bahá'í Philosophy*, 2011, p. 6, last revised version (2014) to be soon published at [www.scribd.com/JeanMarcLepain/](http://www.scribd.com/JeanMarcLepain/).

ralism says that nothing exists outside of nature, with the consequence that all explanations of nature must be sought within nature itself and its various physical constituents. They consequently see no role for metaphysics in scientific investigation.

By contrast, Bahá'í philosophy of nature, while recognizing philosophy of science as a legitimate and imminently useful activity, considers the fact that science alone cannot tell us everything about reality in general and nature in particular. It makes a sharp distinction between 'reality' and 'nature', seeing the latter only as an aspect of the former. Logical positivism's objective of banning metaphysics from philosophy of science is seen as illusory. During the past two decades, there has been a growing consensus that metaphysical issues could not be ignored. John Dupré writes: "It is now widely understood that science itself cannot progress without powerful assumptions about the world it is trying to investigate that is to say a prior metaphysics."<sup>3</sup> Ian Thompson similarly advocates a return to philosophy of nature and ontology. He writes: "The problem, in modern times, is precisely that our maps are fragmented, confused and often appear in contradiction to each other",<sup>4</sup> while Anjan Chakravartty claims that metaphysics should be regarded as "a precursor to its epistemology."<sup>5</sup> Miguel Espinoza considers physics and metaphysics to be part of the same process of understanding nature and that there cannot be any strict separation between the two.<sup>6</sup>

Metaphysical confusion leads to epistemological confusion. Understanding the reasons for this confusion might help us understand the role that a Bahá'í philosophy of nature could play. Many examples can be found in physics, biology and other sciences. Ian Thompson, for example, identifies six interpretations of quantum mechanics based on different ontologies. First, comes the so-called textbook interpretation based on **wave-particle complementarity ontology** of Niels Bohr and Werner Heisenberg, also called the Copenhagen interpretation. **Particle ontology** believes that quantum objects are corpuscles but with counterintuitive behaviors that must be accepted as facts of nature. The **wave ontology** of Schrödinger reverses the previous interpretation and considers that quantum objects are instead waves, with behaviours that make them appear like particles under certain circumstances. The **process ontology** of

---

3. Duprés, John, *The Disorder of Things; Metaphysical Foundation of the Disunity of Science* (Cambridge, MA: Harvard Univ. Press, 1993), p. 1.

4. Thompson, Ian J., *Philosophy of Nature and Quantum Reality* (Pleasanton, CA: Eagle Pearl Press, 2010), p. 3.

5. Chakravartty, Anjan, *Metaphysics for Scientific Realism: Knowing the Unobservable* (Cambridge: Cambridge Univ. Press, 2007), p. 26.

6. Espinoza, Miguel, *Philosophie de la nature* (Paris: Ellipses, 2000), p. 7.

Whitehead and Russell declares that there is no constituting substance in nature and that what appear to us as waves or particles are in reality processes. The **ontology of propensity** builds potentialities and/or dispositions into the very nature of substance itself to explain quantum physics paradoxes. Finally, Born's **statistical interpretation** eliminates all ontology of particulars and says that quantum theory only describes general phenomena and cannot apply to individual systems.<sup>7</sup> With new theories such as the different forms of quantum gravity there are accordingly more than six different ontologies in fundamental physics. It looks like any new theory requires a new ontology.

It is not only quantum mechanics that is affected by ontological confusion. The mathematical formalism of physics manipulates abstract entities whose existence and nature remain highly speculative. Physicists consider that as long as these abstract entities are quantified, there is no problem. However, physics is unable to tell what energy, forces, fields, and the like really are.

Other examples of metaphysical confusion can be found in biology, with for example difficulty of defining the concepts of life, gene and genome, among others. Ten years after the completion of the Human Genome Project, it appears that a wrong ontology of genetics, more based on naturalist ideology than scientific observation, has been responsible for the project's inability to deliver promised curative therapies. This is because a wrong ontology of genes led to wrong assumptions regarding the relationship between genes and disease. Since then, it has become increasingly difficult to think of a gene as a function unit. We see diverging interpretations between the structural and functional understanding of the gene because structural understanding does not depend so much on molecular structure of the gene but rather, on the type of relationship that a particular gene establishes with other genes or with introns (non-protein coding segments of an open reading frame in DNA) and how the gene expresses itself within a certain environment. In turn, this crisis of genetics ontology threatens the neo-Darwinian synthesis that for decades had offered an apparently stable model for understanding evolution. It has, however, become difficult to believe in a direct causal relation between molecular variations in a specific sequence of DNA and a phenotype trait. Putting in doubt this causal relation has devastating consequences for theories like evolutionary psychology that considers human nature and behaviors to be the product of evolution and of our genetic make-up.<sup>8</sup>

---

7. Thompson, *Philosophy of Nature and Quantum Reality*, pp. 39-44.

8. See John Tooby and Lea Comides, "The Psychological Foundations of Culture in Jerome Barkow, Lea Comides and John Tooby," *The Adapted Mind; Evolutionary Psychology and the Generation of Culture* (Oxford: Oxford Univ. Press, 1992), pp.

Morange believes that there is no universally-valid definition of a gene.<sup>9</sup> It has been shown that Mendelian genetics, molecular biology, genetic explanations of ontogeny processes and population genetics use all different concepts of genes based on different ontologies.<sup>10</sup> Ontogeny and phylogeny lead to different classifications of genes. There is the perception among biologists that attempting to formulate a clear definition of genes might be a fruitless enterprise. Some have instead chosen to substitute for genes the concept of the genome – the totality of DNA molecules transmitted from generation to generation – as the most fundamental entity of molecular biology. This makes a lot of sense, as contrary to what Dawkins and most of our non-biologist contemporaries believe,<sup>11</sup> there is growing evidence that in most cases, natural selection does not select genes, but rather, individuals and, therefore, genomes.<sup>12</sup> What is transmitted from generation to generation is the genome, not the genes. However, substituting the genome for the genes can leave philosophers of science dissatisfied. The genome definition is purely descriptive and has no ex-

---

20-136; Eliot Sober and David Sloan Wilson, *Unto Others: The Evolution and Psychology of Unselfish Behavior* (Cambridge MA: Harvard Univ. Press, 1998); De Waal, *Our Inner Ape* (New York: Riverhead Books, 2005); Mark Hauser, *Moral Mind: How Nature Designed our Universal Sense of Right and Wrong* (New York: Harper and Collins, 2006); De Wall, Wright, Korsgaard, Kitcher and Singer, *Primates and Philosophers: How Morality Evolved* (Princeton, NJ: Princeton Univ. Press, 2006), and, of course, many others.

9. Morange, Michel, *The Misunderstood Gene* (Cambridge, MA: Harvard Univ. Press, 2002), p. 27.

10. Duprès, *The Disorder of Things*, pp. 121-23.

11. See Dawkins, *The Selfish Gene*, 2nd ed. (New York: Oxford Univ. Press, 1989).

12. There is no consensus on this point among scientists. The debate concerning the level at which natural selection operates is far from being closed. A sympathetic view of the thesis that selection operates primarily on genes can be found in Roseberg and McShea, *Philosophy of Biology: A contemporary Introduction* (2008), pp. 158-169. Carmen Sapienza presents a defense of that view in her paper “Selection Does Operate Primarily on Genes,” *In Defense of the Gene as the Unit of Selection* (New York and London: Ayala and Arp Routledge, 2010), pp. 127-40, while Richard Burian presents the opposite position in his paper “Selection Does not Operate Primarily on Genes” in the same book. The confrontation between the two papers shows that since the 1980s there has been a considerable evolution that brings the two positions much closer. Additional literature on the subject includes R. Brandon and R. Burian, *Genes, Organism, Population: Controversies over the Units of Selection* (Cambridge MA: MIT Press, 1984); R. Burian’s 2005 paper “Too Many Kinds of Genes? Some Problems Posed by Discontinuities in Gene Concepts and the Continuity of the Genetic Material” (available at [www.phil.vt.edu/Burian/GeneKindsCVP.pdf](http://www.phil.vt.edu/Burian/GeneKindsCVP.pdf)); S. Okasha’s 2006 paper “The Level of Selection Debate: Philosophical issues” (available at [www.blackwellpublishing.com/pdf/compass/PHCO\\_001.pdf](http://www.blackwellpublishing.com/pdf/compass/PHCO_001.pdf)); and various others.

planatory value because the molecular structure of the genome is too complex to be readily used. It is impossible to define what a genome mutation could be because mutations take place at the gene level, leaving again the neo-Darwinian Synthesis in disarray.

The problem of gene definition cannot be solved by science without resorting to ontological considerations simply because there can be many different ways of slicing reality. Two things must be taken into consideration. First, the genome cannot be isolated from its environment and, second, several levels of organization exist in the genome. Most attempts at defining the gene start from the assumption that the gene is either a 'primitive' object or that the gene organizational level is the most primitive level. These questions are questions more for philosophy of science and show that science, either theoretical or experimental, cannot be isolated from philosophy of science which is often introduced covertly. As we will see later, the notion of 'primitive object' is not part of Bahá'í philosophy of nature which is based on necessary relationships. In that case, it could be that relations between genes are a more fundamental level of explanation than the gene itself.

Many scientists acknowledge the existence of metaphysical or ontological issues in their disciplines but consider that these issues are no obstacle to scientific progress. This is because their understanding of science is inspired by instrumentalism and phenomenism, which assigns to science the limited role of formulating theories enabling correct predictions or merely producing descriptions of experimental results and observations. From a Bahá'í perspective, the objective of science is not only to produce knowledge that will generate technologies capable of improving our life but also to bring about a closer understanding of our place within nature and its implication for our spiritual development.

#### *A Holistic Approach to Reality*

Another fundamental difference between philosophy of science and philosophy of nature is that the latter takes a holistic approach to reality. Science is analytical in the sense that it understands a system by the working of its parts. This is a powerful method that has brought great success. However, under such an approach nature appears as highly fragmented. The result is not a unified model of nature but an entanglement of maps established at different scales and using different measurement units, different concepts and different methodologies and often at conflict with each others. By contrast, without neglecting the discontinuous aspect of nature, philosophy of nature looks more at the continuous aspects and at the interconnections between the different fields of knowledge.

This holistic approach to reality cannot be achieved by connecting together the various maps of nature's sub-systems produced by science. The heterogeneity of these maps is irreducible and any attempt to reduce them to the same language would deprive them of any useful meaning. This is the reason for which philosophy of nature cannot replace the various philosophies of science such as the philosophy of physics or philosophy of biology.

Our holistic approach cannot either be reached by ontology, because ontology operates in a way that is very similar to science by trying to identify the smallest logical constituent of reality and suggest reduction to a unique scale or dimension of reality. Rather this holistic approach is based on identifying the logical structure of reality that can produce concepts independent from any scale of reality or from any field of science. We will see that in this approach the concept of necessary / non-necessary relationship, developed by 'Abdu'l-Bahá, plays an eminent role. This holistic approach leads to a complementary view of reality, also called in the past *conjunctio oppositorum*, in which a representation of reality is reached from the superposition of different perspectives, which helps to solve apparent contradictions between various aspects of reality.

#### *Philosophy of Nature and Subjectivity*

While philosophy of science pretends to be anthropologically neutral, philosophy of nature considers that the existence of conscious beings is central to any explanation of nature. The first mystery of nature is the existence of something rather than nothing. The second mystery is our own existence which, as Brandon Carter demonstrated through his anthropic principle, constrains the conditions prevailing at the time of the Big Bang and the selection of laws of nature and universal constants.<sup>13</sup> The fact that we live in the only universe compatible with our existence is something hard to deny. We will see that Bahá'í metaphysics considers consciousness as an emergent property that owes its existence to specific characteristics of the universe we are living in. This means that our existence as conscious beings cannot be dissociated from the structure of nature and therefore nature is conveying to us meaningful message about who we are and how to understand our place in the natural order.

#### *Philosophy of Nature and the Theory of Intelligibility*

In the same way that philosophy of science requires an epistemology, a philosophy of nature requires a theory of intelligibility. We cannot make significant progress in our understanding of the metaphysical framework

---

13. Barrow and Tipler, *The Anthropic Principle* (Oxford: Oxford Univ. Press, 1998).

of Bahá'í philosophy of nature unless we address the issue of intelligibility.

There is a major difference between a theory of intelligibility and epistemology. While epistemology answers the question: "How do we know what is in the world?" intelligibility answers the question "What is there in the world that we can know?" Whereas epistemology is limited in scope by its naturalist paradigm, a theory of intelligibility must be grounded in ontology and metaphysics. Such a theory must address the following key questions: (i) what is the relationship between reality and the human mind; (ii) what is human capability to understand reality and what could be the limit of that capability if any; (iii) what makes nature intelligible and what are the conditions of that intelligibility, (iv) what is the relationship between intelligibility and spirituality, or between rationality, intuition and other forms of knowledge.

When discussing the question of intelligibility, the Bahá'í writings raise different issues. The first issue, related principally to epistemology, is the absence of a sure foundation for human knowledge. A second issue is the limits of intelligibility. A third issue is the relationship between rationality, language and intelligibility. A fourth issue is the relationship between an individual's knowledge and their spiritual development.

In *Some Answered Questions*, 'Abdu'l-Bahá states that there are four sources of knowledge: sensory data, rational reasoning, the authority of tradition and of Holy Scriptures, and intuition.<sup>14</sup> He demonstrates that none of these sources can lead to any certainty: "They are all faulty and unreliable."<sup>15</sup> The only hope of achieving an understanding of reality is by combining these four sources of knowledge. This is what I call the *epistemological agreement* that represents the ideal of Bahá'í philosophy. Sensory data is notably unreliable. Philosophers who follow the path of reason can scarcely agree on anything. Even supposedly well-established scientific theories can be rapidly displaced by a competing theory, and each theory is subject to various interpretations. The history of philosophy shows that theologians who view themselves as the guardians of exegesis have greatly erred through the centuries. As for inspiration, it is difficult to distinguish genuine spiritual inspiration from the prompting of the Self. It is only by combining these four sources of knowledge that we can hope reaching a better understanding of reality. However, 'Abdu'l-Bahá warns us that reaching an agreement between the four sources of knowledge cannot be a purely intellectual process because human intel-

---

14. 'Abdu'l-Bahá, *Some Answered Questions* (latter abbreviated as SAQ) (Wilmette, IL: Baha'í Publishing Trust, 1981), pp. 297-98.

15. *Promulgation of Universal Peace* (latter abbreviated as PUP) (Wilmette, IL: Baha'í Publishing Trust, 1982), pp. 22, 255.



lect is faulty: “. . . there is no standard in the hand of people upon which we can rely.” By his own effort no human being can reach true understanding of reality. Such an understanding can only be reached through the assistance of the Holy Spirit: “But the bounty of the Holy Spirit gives us the true method of comprehension which is infallible and indubitable. This is through the help of the Holy Spirit which comes to man, and this is the condition in which certainty can alone be attained.”<sup>16</sup> Elsewhere, ‘Abdu’l-Bahá says “How shall we attain the reality of knowledge? By the breaths and promptings of the Holy Spirit, which is light and knowledge itself. Through it the human mind is quickened and fortified into true conclusion and perfect knowledge.”<sup>17</sup> The process of obtaining the assistance of the Holy Spirit requires some form of “openness” which is directly linked with personal and collective spiritual development. Clearly no sure method exists to reach this epistemological agreement, if by method we intend a purely intellectual process. Accepting this position means that intellectual and scientific knowledge is limited and cannot give us a full understanding of reality. From a scientific perspective human knowledge must therefore remain without firm foundation.

The second issue we have to deal with is the intelligibility of nature. The basic idea behind Bahá'í philosophy of nature is that nature is the manifestation of a more fundamental reality. Nature by itself is intelligible in most of its manifestations, but a deeper analysis of nature requires not just science but ontology and intuition in order to include our subjectivity and the fact that we are ourselves part of nature.

The human existential *situs* limits our perception to a certain ontological horizon. What is behind that horizon can only be guessed. This situation creates the illusion of duality between a spiritual and a material world while, in fact, there is only one world. The spiritual world has an influence on the material world that cannot be explained in scientific terms. Man is caught in a *hermeneutical circle*: to know himself, he needs to know God and the world; to know the world, he needs to know himself and God; and, of course, he cannot know God unless he understands himself and the world. The circularity of human knowledge is another reason for the limits of intelligibility and for the absence of a sure foundation of human knowledge. Knowledge can never be fully objective. The reason that there is so much disagreement in contemporary metaphysics is that all systems have hidden assumptions about our place in the universe and its meaning. As long as we do not have a consensus on this question, it is difficult to reach a consensus on anything else.

---

16. SAQ, p. 299.

17. PUP, p. 22.

A comprehensive theory of intelligibility cannot be developed in isolation but instead requires linkage with a theory of rationality and a theory of language. In the Bahá'í writings, rationality includes spirituality because rationality is the capacity to see beyond appearance. Rationality is a manifestation of the Logos, the Word of God, and we can expect that everything created follows the same rationality, even if this rationality might not be fully intelligible to us. Language is what links us to the universal rationality and makes it intelligible to us. Language is the incarnation of rationality and the instrument of spirituality. We are rational beings, and, therefore, spiritual beings too, because we are beings endowed with linguistic capability.

‘Abdu’l-Bahá says that man can understand the abstract only through the concrete.<sup>18</sup> Lakoff and Johnson demonstrated that all abstract ideas, but not only abstract ideas, are metaphors or metaphors of metaphors. “Time passes” or “flows”, “problems are burden”, “we grasp an issue”, “life is a journey”, “affection is warmth”, “prices rise” and “markets plummet” are all metaphors which have been developed using rules that have shaped our mental life. All expansion of our knowledge and experience requires the spinning of new metaphors.<sup>19</sup> Metaphors not only shape our ordinary language, but as Theodor Brown has shown, metaphorical thinking has also produced some of the best science.<sup>20</sup> Metaphors reveal the underlying common rationality of all phenomena. Metaphors generate meaning, and meaning is what links rationality to spirituality. But the Bahá'í writings go one step further: metaphors are part of nature. Not only are metaphors part of nature but we can see God’s creation as a nexus of metaphors.<sup>21</sup> If nature uses fractal geometry like a “copy and paste” function (another metaphor), there is no surprise that it could use also

---

18. “Tablet to Professor Forel” also quoted in *Bahá'í World Faith*, 6th printing of the 1956 edition (Wilmette, IL: Baha'i Publishing Trust, 1976), p. 336: “The mind comprehendeth the abstract by the help of the concrete, but the soul has limitless manifestation.” A revised translation can be found in *The Baha'i World*, vol. XV (1968-1973) (Haifa: Baha'i World Centre, 1976), pp. 37-43 or at <http://www.gutenberg.org/files/19292/19292-h/19292-h.html>. In the online version the quotation appears on pp. 6-10, paragraph 6.

19. See Lakoff and Johnson, *Metaphors We Live By* (Chicago, IL: Univ. of Chicago Press, 1980), and *Philosophy in the Flesh: The embodied Mind and its Challenge to the Western Thought* (New York: Basic Book, 1999).

20. Brown, Theodore, *Truth Making: Metaphors in Science* (Champaign IL: Univ. of Illinois Press, 2008).

21. Lepain, Jean-Marc, *Archéologie du Royaume de Dieu; Ontologie des Mondes Divins dans les Ecrits de Baha'u'llah* (Paris: Librairie Baha'ie, 1993), pp. 64-5; *Le Principe Anthropique; Le Problème de l'Intelligibilité et de la Rationalité du Monde dans la Pensée de Baha'u'llah* (Paris: Librairie Baha'ie, 1995), p. 52, available at [www.bahai-biblio.org](http://www.bahai-biblio.org).

transposition of one principle from one domain to another domain, from one level of reality to another level. Laws of nature could be the manifestations of such a process. This is the reason that nature in particular and God's creation in general are endowed with meaning for humans. Metaphors reveal the common rational structure that links all the different ontological levels of the universe.<sup>22</sup>

Last but not least, even if science can readily understand natural phenomena, it cannot grasp the universe in its totality and it cannot understand its relationship with what Bahá'u'lláh describes as other "worlds." However, it appears clear that these worlds interact with each other and that certain fundamental aspects of our universe depend on these interactions. For that reason, some natural phenomena will always appear mysterious. This is the case concerning the origin of the universe itself, but also regarding the appearance of life, the existence of consciousness, free will and the nature of the human soul, all of which cannot be explained in purely naturalistic terms. Some aspects of God's creation are fully intelligible and accessible to human rationality, while other aspects are mysterious. There are countless passages in the Bahá'í writings about the mysterious aspects of the world we live in. Here are some similarities with the position of a group of philosophers called the Mysterians. Collin McGinn, who coined the expression 'transcendental Naturalism' to describe this position, writes: . . . we are programmed to employ concepts that are mysteries to us at a logical level. We can solve problems by using these concepts, but we cannot solve the problems they themselves raise. . . .<sup>23</sup>

This situation is due to the cognitive architecture of our mind: "Philosophy is an attempt to get outside the constructive structure of our mind. Reality itself is everywhere flatly natural, but because of our cognitive limits we are unable to make good on this general ontological principle. Our epistemic architecture obstructs knowledge of the real nature of the objective world."<sup>24</sup> Consequently, "we are trying to force our cognitive faculties to deliver knowledge of phenomena whose nature those faculties are not cut out to comprehend."<sup>25</sup> While McGinn thinks that the reasons for human cognitive limitation are essentially biological, the Bahá'í writings give a more metaphysical interpretation. Those limitations are due to our position in the chain of being and to discontinuous aspects of reality. John Carroll holds similar views, but instead of concluding that philosophy is doomed, he concludes that science will remain always incom-

---

22. *Ibid.*

23. McGinn, Collin, *Problems in Philosophy: The Limits of Enquiry* (Oxford: Blackwell, 1993), p. 21.

24. *Ibid.*, p. 2

25. *Ibid.*, p. 150.

plete.<sup>26</sup> This incompleteness is the result of the nature of the “*inanimate*” world. After reviewing the relationship between necessity, the laws of nature and causation, Carroll concludes: “The various examples discussed . . . show that we may not be intelligent enough to discover every fact, that we may not have the requisite sensory ability to discover every fact, and that events in the external world may occur in such a way as to prevent us from discovering every fact.”<sup>27</sup> This thesis of the incompleteness of philosophy and science is fully supported by the Bahá'í writings.

### *Metaphysics and Philosophy of Nature*

Bahá'í metaphysics is premised on the notion that the physical reality is not the entire reality of the existing universe. It might even be difficult to distinguish clearly between a so called physical reality and a broader understanding of reality that includes non-physical elements. The universe is made not only of physical elements but possesses an ontological structure that is distinct from its physical structure. This ontological structure is believed to have causal powers that put constraints on the manner in which the physical reality unfolds.

To understand the place of metaphysics in Bahá'í philosophy generally, and in Bahá'í philosophy of nature in particular, it is necessary (i) to understand the relationship between metaphysics and the Bahá'í theory of intelligibility; (ii) to define the metaphysical framework existing in the Bahá'í writings and its implications for the ontological structure of reality, and finally (iii) to understand the relationship between metaphysics, science and other fields of knowledge such as sensory experience, intuition, faith and the like.

The place occupied by metaphysics in Bahá'í philosophy flows directly from the theory of intelligibility. Metaphysics cannot rely only on the use of logic as a methodology. It must be part of *the epistemological agreement* described earlier. In the nineteenth century, metaphysics came to be criticised as being purely speculative. Bahá'u'lláh also strongly condemns scholastic or speculative metaphysics, which he describes as “sciences that begin with words and end with words.”<sup>28</sup> Metaphysics, like science and religion, is a means of investigating reality. It can start only from the observation of nature and for this reason, ontology should be considered as part of the philosophy of nature. Ontology tells us what exists, and this question is one of the most fundamental questions of science

---

26. Carroll, John W., *Laws of Nature* (Cambridge: Cambridge Univ. Press, 1994), p. 153.

27. *Ibid.*, p. 157.

28. Baha'u'llah, ‘Tajallíyyât (3rd),’ in *Writings of Baha'u'llah*, 3rd expanded ed. (New Delhi, India: BPT, 2006).

and of philosophy of nature. Indeed, it is precisely where science and metaphysics meet. Metaphysics itself should not be seen as a distinct branch of philosophy of nature but rather as a component of all the main three branches of Bahá'í philosophy.

Bahá'í philosophy must of course remain based on the Bahá'í writings, which contain a significant amount of material about the nature of reality. This is what I call *the metaphysical framework* of Bahá'í philosophy – elements of which will be described in the next section of this paper. Because there is no definite foundation of human knowledge and because not everything is knowable or can be described in scientific terms, there are in all philosophies a number of propositions that are called primitive (in the sense that they cannot be demonstrated). The existence or non-existence of God and the naturalistic assertion that nothing exists outside of nature are typical examples of primitive propositions. Following these primitive propositions, there are a number of other propositions that are not primitive but which cannot be demonstrated without recourse to primitive propositions. We also find in the Bahá'í writings other statements about the nature of reality that may be viewed as 'metaphysical' but which are strongly correlated to scientific propositions (in the sense that a scientific interpretation of these statements might be possible). The discontinuity of reality and the organization of nature within hierarchical levels of complexity is a good example of a thesis found in the Bahá'í writings, which is susceptible to scientific refutation or justification. In so doing, we must remember that the Bahá'í writings are not considered authoritative with regards to scientific questions and when statements about the nature of physical reality are found they should be interpreted in the light of the best science available, knowing that our knowledge is not definitive. The purpose of the Bahá'í writings is not to inform us about the nature of the physical reality but to provide guidance for our spiritual development. In similar terms, although ontology should be seen as part of the philosophy of nature, the primary purpose of metaphysics is not to inform us about the nature of reality but to inform us about human nature. However, we cannot understand the concept of human nature unless we understand our relationship to the universe and our relationship to God. This is what I called in a previous work *the hermeneutic circle*.<sup>29</sup>

This naturally raises the question of the relationship between science and metaphysics. When the aim of eradicating entirely metaphysics from philosophy was proved illusory, analytical philosophers like Quine have proclaimed that metaphysics is '*continuous to science*'. Since then, we have seen the flourishing of various proposals for the complete 'naturali-

---

29. Lepain, *Archéologie du Royaume de Dieu*, pp. 220-21.

zation' of metaphysics – i.e., the idea that metaphysics does not need metaphysical concepts but can be developed using only concepts of physics, or proposals for the reduction of metaphysics to scientific realism or the idea that the role of metaphysics can be reduced to providing science with criteria allowing it to distinguish between real physical objects from intellectual devices created by the mathematical formalism of physics. It is not difficult to refute such theories for many reasons; one of them being that they imply a reduction of all sciences to physics; something that only die-hard naturalists are ready to believe, and other reason being, as we have seen, that there is no epistemological agreements among physicists about the exact meaning of the physical concepts they use. Last but not least, such explanations invariably lead one to posit some kind of physical entities as 'primitive' and beyond any explanation. For example, Tim Maudlin writes: "The laws of nature stand in no need of 'philosophical analysis'; they ought to be posited as ontological bedrock."<sup>30</sup> He also takes space-time as being primitive. Such attempts at the naturalization of metaphysics always end up in constricting dramatically the field of metaphysics and putting a number of disturbing questions 'off limits'. Although these theories might appeal to some physicists, they are not widely supported by most biologists and scientists from other branches of science. All ontological questions are not amenable to the methods of empirical science. Physics remains an incomplete science, and an incomplete science cannot provide ontology capable of explaining all natural phenomena as well as the logical structure of reality. We still do not know if the ultimate building blocks of physical reality are strings, branes or something else. We cannot explain the expansion of the universe unless we assume the existence of very mysterious entities such as a cosmological constant, singularities, dark matter and dark energy. The fact that 96 percent of the universe's mass remains undetected is not very reassuring as to the completeness of our physical theories. We do not know how general relativity applies at a low-energy limit. We do not know what happens under the Planck length ( $10^{-33}$  cm). We are unable to choose between string theories and quantum gravity theories, which in turn exist in multiple variants. Considering physics' lack of knowledge about the most fundamental layer of reality, one can doubt that metaphysics can be naturalized or that physics can sort out the true nature of physical entities using its mathematical formalism. On the other hand, metaphysics can pro-

---

30. Maudlin, *The Metaphysics within Physics* (Oxford: Oxford Univ. Press, 2007), p 1. See also John Carroll, *Laws of Nature* (Cambridge: Cambridge Univ. Press, 1994), who follows the same path. John Lowe, *A Survey of Metaphysics* (Oxford: Oxford Univ. Press, 2002), has presented a number of important arguments against the naturalization of metaphysics.

vide critical tools for resolving some of physics' ontological issues. Obviously there are some elements of continuity between science and metaphysics as there are elements of continuity between metaphysics and theology, hermeneutics, philology, linguistics and almost any form of human knowledge. But to say that metaphysics *must be* 'continuous' to or coextensive with science is certainly wrong. Even a logical positivist like Russell opposed that view.<sup>31</sup> Bahá'í philosophy does not see metaphysics as continuous to science but as the result of an epistemological agreement between all sources of knowledge. This means that metaphysics (or religion as often mentioned by 'Abdu'l-Bahá) should not enter into contradiction with science. As a consequence, one of the responsibilities of Bahá'í metaphysics is proposed interpretation of Bahá'í writings regarding the nature of reality in the light of the latest progress in science. In this task, two levels must be considered. The first level considers our understanding of the world. While science is more concerned with the explanation of discrete phenomena, metaphysics is more concerned with our understanding of the universe as a whole through the development of macro-concepts such as interconnectedness, continuity and discontinuity, complexity, order, laws of nature, causality, evolution, diversity, adaptation, entropy, chance, stochasticity and determinism. A second level of metaphysics considers what sort of ontology can explain the macro-concepts developed at the first level.

### *Science, Philosophy and Religion*

We have already asserted the view that the Bahá'í Faith sees philosophy as the interface or the mediator between science and religion. As a religion, the Bahá'í Faith is unique in the fact that it places as much authority in science as in its own writings, to the point of making the agreement between science and religion mandatory: "Religion and science must conform and agree. If a question of religion violates reason and does not agree with science, it is imagination and not worthy of credence."<sup>32</sup>

If much has been written on the ways and means of reaching that agreement, very little attention has been given to the metaphysical principles that render this agreement necessary. This can be summarized as follows: science and religion, and by extension philosophy, have the same purpose – namely the understanding of reality. However, they operate on different levels of that reality. For that reason their views are complementary, and conflict between the two should be impossible in principle, although there are a few areas where science and religion tend to overlap

---

31. Glock, Hans-Johan, *What is Analytical Philosophy?* (Cambridge: Cambridge Univ. Press, 2008), p. 135.

32. PRP, p. 169.

such as in the discussion concerning Darwinian evolution. If conflicts occur it is because there has been some confusion between the two levels of intelligibility.

‘Abdu’l-Bahá appears to accord science, nature and religion identical definitions. In *Some Answered Questions* he writes: “Religion, then, is the **necessary connection** which emanates from the reality of things.”<sup>33</sup> In the “Tablet to August Forel,” he gives a similar definition of nature: “By nature is meant those **inherent properties and necessary relations** derived from the realities of things.”<sup>34</sup> As science is also the study of ‘*necessary relations*’ existing between things, the consequence is that “Religion and science are the same; they cannot be separated from each other”<sup>35</sup> because “The basis of religion is reality itself.”<sup>36</sup> Soon we will see that this ‘*necessary connection*’ is a key concept underpinning the Bahá’í philosophy of nature and its ontology.

However, if science and religion have the same purpose (namely the study of necessary relations existing between things), they do not operate on the same level of reality and do not have the *same modus operandi*. While science deals with the physical world, religion is primarily concerned with the spiritual development of humankind. This spiritual development can be understood in terms of ‘*necessary relations*’ existing between the body and the soul on one hand and the soul and the spiritual worlds on the other. Physical reality is viewed as an instrument of spiritual development. Religion is interested in science because we need a better understanding of how physical reality can contribute to our spiritual development, because science can contribute to the well-being of humanity and to the advancement of civilization, and because understanding the mysteries of the universe helps us understand ourselves and our relationship to God’s creation.

## 2. The Bahá’í Concept of Nature

---

33. SAQ, p. 159

34. “Tablet to Professor Forel” (later abbreviated as Forel), revised translation published in *The Bahá’í World*, vol. XV (Haifa: Baha’i World Centre, 1976), p. 38 and can be found at <http://www.gutenberg.org/files/19292/192902-h/19292-h.html>. The quotation can be found on pp. 11-20, paragraph 4 and remains unchanged from previous translation.

35. From a Tablet of ‘Abdu’l-Bahá quoted in a memorandum of Research Department of the Universal House of Justice dated 14 January 1991.

36. *‘Abdu’l-Bahá on Divine Philosophy* (latter abbreviated as ADP), Compiled by Elisabeth Frazer Chamberlain (Boston, MA: Tudor Press, 1918), p. 186, on line at [www.bahai-library.com/abdulbaha\\_divine\\_philosophy](http://www.bahai-library.com/abdulbaha_divine_philosophy).



It seems possible to identify in the Bahá'í writings five different views of nature, which can be seen as complementary: (i) nature is the expression of God's will; (ii) nature is a modality of reality; (iii) nature is an intelligible reality, (iv) nature is the expression of the necessary relations existing between the realities of things, and (v) nature is a unifying agency. Once these perspectives are woven together, a compelling and deeply philosophical representation of nature emerges.

*Nature as the will of God*

Bahá'u'lláh defines nature as the expression of God's Will in his creation:

Nature in its essence is the embodiment of My Name, the Maker, the Creator. Its manifestations are diversified by various causes, and in this diversity there are signs for men of discernment. Nature is God's will and its expression in and through the contingent world. It is a dispensation of Providence ordained by the Ordainer, the All-Wise. Were anyone to affirm that it is the Will of God as manifested in the world of being, no one should question this assertion. It is endowed with a power whose reality men of learning fail to grasp.<sup>37</sup>

There are a number of important ideas expressed in this quotation. Nature is the instrument of God and manifests His purpose. Nature has a spiritual dimension, and humanity can learn important lessons from it. From a spiritual perspective, understanding nature is tantamount to understanding the purpose of God in creating the physical reality. Laws of nature express the will of God and as a consequence, God does not need to interfere with the working of nature. Experience shows that the laws of nature are sufficient to accomplish God's purpose: there is no need for divine intervention in nature, and science need not be concerned by questions such as the existence of God.

*Nature as a Modality of Reality and as an Intelligible Reality*

'Abdu'l-Bahá's book *Some Answered Questions* opens with a chapter on nature. The first paragraph of that chapter provides a sort of definition of nature which is neither easy to translate nor to understand. The first sentence is very elliptical and may be translated literally as follows: "Nature (*tabíyyat*) is a modality (*kayfíyyat-i*) or a reality (*haqíqat-i*)." There is no doubt that much ink will be spent in attempting to explain this first

---

37. Baha'u'llah, *Tablets of Wisdom*, in WOB, p. 447.

sentence. I believe that it could be paraphrased as: “Nature is a modality of existing things that is an intelligible reality”.

*Kayfíyyat* is a word that translates Aristotle's category of ‘modality’ or ‘quality’. The word comes from the Arabic ‘*kayf*’ (how) and in response to the question of ‘How is that thing?’ It denotes a mode of being. It stands in contrast to the question ‘What is that thing?’ which instead denotes its quiddity. The origin of the term dates back to Aristotle's *Categories*, which enumerates all possible kinds of thing that can be the subject or the predicate of a proposition. The third category is ‘Quality’ (*poion*) which characterizes the nature of an object by identifying its essential properties. In Islamic philosophy, the term came to denote the mode of existence of an essence. There might be two ways to translate the word *kayfíyyat* within this context. The first is to consider the sentence “*tabíyyat kayfíyyat-í'st*” to mean “Nature is a set of properties or qualities”. In this sense, this definition of nature is indistinguishable from the definition of nature as a set of necessary relations between things. However, a second interpretation is possible as the word *Kayfíyyat-î* is used with the definite article, and hence the sentence can also be paraphrased as “*Nature is one of the modalities of reality among other modalities.*” This means that nature is one aspect among many aspects of reality. In my view, both meanings are intended. It follows that nature, when considered as a set of properties (as it is considered by science) is only one modality through which reality, including the physical universe, is perceived by us. Other modalities, or other ways to consider the universe, exist. When we see reality as nature, we do not see reality in all its aspects. Put another way, there is more to reality than simply nature. This definition of nature carries significant philosophical implications.

The second term of the definition, *haqíqat*, is usually translated as ‘reality’. ‘Reality’ is a vague term that can mean either ‘essence’ or an ‘intelligible reality’; an entity that exists on a metaphysical level, an abstraction, but an abstraction existing independently from the human mind. In the same book, ‘Abdu'l-Bahá adds this comment: “In the same way, nature, also, in its essence, is an intellectual (intelligible) reality and is not sensible. . . .”<sup>38</sup> It clearly follows that nature is not something that can be perceived through the senses but only through the intellect. Nature is, therefore, defined as a metaphysical category. When read together, the two elements of ‘Abdu'l-Bahá's definitions mean that nature should not be seen as an assembly of things but as an organic whole whose existence transcends the existence of its components.

---

38. SAQ, p. 83.

*Nature as Necessary Relations between the Realities of Things and as Unifying Agency*

As we have already seen, ‘Abdu’l-Bahá in the “Tablet to Professor August Forel” provides another definition of nature:

By nature is meant those inherent properties and necessary relations derived from the realities (essence) of things. And these realities of things, though in the utmost diversity, are yet intimately connected one with the other.<sup>39</sup>

From a metaphysical vantage-point, this definition, which does not contradict the one given in *Some Answered Questions*, is highly important, as it introduces the concepts of “inherent properties”, “necessary relations” and “essence” which are, we believe, the key elements of Bahá'í ontology. We will consider them in greater detail in the last section of this paper. The general idea is that nature is a nexus of necessary relations existing between things. Through them everything is linked to everything. The universe is made of things, but nature is made of processes and necessary relations stemming from their inherent properties manifested by things according to their essence. These processes and necessary relations constitute this modality of reality that we have just discussed.

Because nature is a nexus of processes and necessary relations, it is more than the sum of its parts. Although nature might appear to be discontinuous and made not only of objects but of different subsystems, it contains properties and potentialities which are not possessed by its components. Through the universality of a natural order, and as a manifestation of a more fundamental law, it forms one single body endowed with an existence of its own. This is probably what ‘Abdu’l-Bahá means when he calls nature a unifying agency, as is shown in this quotation:

For these diverse realities an all-unifying agency is needed that shall link them all one to the other. For instance, the various organs and members, the parts and elements, that constitute the body of man, though at variance, are yet all connected one with the other through that all-unifying agency known as the human soul that causeth them to function in perfect harmony and with absolute regularity. . . .<sup>40</sup>

---

39. “Tablet to Professor Forel,” pp. 11-20, paragraph 4 at <http://www.gutember.org/files/19292/19292-h/19292-h.html>.

40. Tablet to Professor Forel, *ibid.*, pp. 11-20, paragraph 4.

Nature is, therefore, not merely the collection of all existing things. It is a repository of information, including properties and relations. Nature is more than the sum of all the particulars and relations that constitute it.<sup>41</sup> It has properties and dispositions of its own which cannot be found in the particulars.

*Continuity and Discontinuity in Nature*

The Bahá'í writings appear to uphold two contradictory views: the first is the unity of the world of existence, the second the discontinuity of reality. These conflicting views of reality are due to our limited cognitive capacity, as explained in the theory of intelligibility. What we perceive is discontinuity, while what actually exists is continuity. However, discontinuity is not a mere illusion: it is just that we do not have the cognitive tools to reconcile and articulate logically the two aspects of reality. Science will be more concerned by discontinuity while metaphysics will be more concerned with establishing the principles of continuity. However, neither can ignore these two complementary aspects of reality. Continuity and discontinuity in nature are the two faces of the same coin.

‘Abdu’l-Bahá writes: “Reality is one; it does not admit plurality.”<sup>42</sup> This means that the distinction that we make between a spiritual world and a material world is not real. This distinction appears to us only because of our cognitive limitations. Fundamentally, there is only one reality and that reality has spiritual and material manifestations. Because the material world exists inside the spiritual world, physical realities also have a spiritual dimension. In this regard, a sharp distinction between the material and the spiritual is sometimes difficult. Because the two worlds are not separated, they interact with each other. Some necessary relations

---

41. It might be useful at this stage to clarify the concept of ‘particular’. Based on standard definitions found in various dictionaries of philosophy, a particular is member of a class as opposed to the property which defines that class or a particular can be an individual as opposed to a universal. Particulars are often opposed to universals because universals need particulars to be exemplified; but particulars can be different from individuals and can be changing (Abelard gives the example of a flame as a changing particular; Strawson gives the example of mental states). Particulars can also be abstract. They include not only physical objects, but concepts, consciousness, mental states or events. Particulars do not need to have individuality but they need a quiddity and here we are on solid ground because ‘Abdu’l-Bahá attributes quiddity to the constituents of nature. As the concept of particular has a very broad meaning, I will use it every time that the nature of objects cannot be specified or to reflect the heterogeneity of natural objects. While rocks and birds are tangible realities, this is not the case of elementary particles that do not have locality and do not seem to have independent individuality either.

42. PRP, p. 297; Makátib-i-‘Abdu’l-Bahá published by Faraju’lláh Zakí al-Kurdí, Cairo, 1921, Vol. I, p. 341 available on line at [www.h-net.org/~bahai/abtext.htm](http://www.h-net.org/~bahai/abtext.htm).

operate across the two worlds and bind spiritual and material things together.

On the other hand, the way we perceive reality is discontinuous. Nature is made of subsystems organized hierarchically and operating through different sets of principles. The most obvious discontinuity in reality is the distinction we made between minerals, plants and animals, but we can also find elements of discontinuity inside each kingdom and even between closely related species. Based on Aristotle, 'Abdu'l-Bahá uses a classification that divides reality into five kingdoms: the mineral kingdom, the vegetable kingdom, the animal kingdom, the human kingdom and the spiritual kingdom. It would be mistaken to give biological taxonomic value to such classification which is not concerned with biological taxonomy but with metaphysical relations. Its only purpose is to establish that the human soul does not originate from nature but rather from the spiritual world. However, it clearly demonstrates the principle of the discontinuity of reality. The same principle exists in Bahá'u'lláh's writings where he distinguishes various worlds, designated by Aramaic names such as *Násút* (the human world), *Malakút* (the spiritual world), *Jabarút* (the world of the divine will), *Láhút* (the world of the divinity) and *Háhút* (the world of the unmanifested).<sup>43</sup> However, he uses many other phrases such as 'the world of the divine essence', 'the world of existence', 'the world of being',<sup>44</sup> 'the world of the visible and invisible',<sup>45</sup> 'the world of contingency',<sup>46</sup> 'the world of the divine command',<sup>47</sup> "the realm of revelation and creation",<sup>48</sup> and 'the kingdom of names'.<sup>49</sup> I have already demonstrated elsewhere that the notions of 'world' or 'kingdom' repre-

---

43. For a more detailed analysis see my article "The Tablet of All Food: The Hierarchy of the Spiritual World and the Metaphoric Nature of Reality," in *Bahá'í Study Review*, 16, 2010: 43-60, and my book *Archéologie du Royaume de Dieu*, [www.bahai-biblio.org/centre-doc/ouvrage/archeologie-royaume-dieu/](http://www.bahai-biblio.org/centre-doc/ouvrage/archeologie-royaume-dieu/), ch 1, 2, and 5.

44. The 'world of existence' and the 'world of being' are two different translations of the same Persian expression ('*álam-i-wujúd*). Examples of the use of this expression can be found in "Epistle to the Son of the Wolf" in *Writings of Baha'u'llah*, 3rd expanded ed. (New Delhi, India: BTP, 2006), hereafter abbreviated in WoB pp. 594 and 597.

45. See *Prayers and Meditations by Baha'u'llah*, XIII, in WoB p.799, XXXI, p. XLIV, p. 821, LXXII, CLXXVIII, or *Munaját (Prayers and Meditations in Arabic)*, n° 38 (Rio de Janeiro: Editora Baha'i-Brazil, 1981), p. 41 for an example in Arabic.

46. See, for example, SAQ, Ch. 38, p. 152, and ch. 80, p. 281.

47. In Persian '*álam-i-Amr*. Shoghi Effendi often translates this expression by *Kingdom of thy Cause*. See "Gleanings of Baha'u'llah," CLV, in WoB p. 777. See also *Munaját*, n° 75 (Rio de Janeiro: Editora Baha'i-Brazil, 1981), p. 86, and n° 80, p. 92.

48. See *Prayers and Meditation by Baha'u'llah*, XXXI, in WoB p. 808

49. See *Prayers and Meditations*, LVI, in WoB p. 830, and *Munaját*, p. 83.

sent hermeneutical or epistemological concepts rather than ontological domains. A world is a category of intelligibility. On one hand, reality is discontinuous because each world, or kingdom, requires a separate mode of intelligibility and, therefore, different ontology. On the other hand, not every world is part of a hierarchical order. Many names of worlds simply try to capture various aspects of reality. A better understanding of reality requires a juxtaposition of different perspectives, different hermeneutic categories. This idea of discontinuity of reality, or of nature, has far-reaching consequences. It explains why unity of science is impossible. Each natural kingdom, having a different ontology, requires a different scientific methodology. Reduction of one level of nature to another is impossible and, as a consequence, so too is the completeness of science. Although biology includes physics and chemistry, it cannot be reduced to physics or chemistry and chemistry cannot be reduced to physics.<sup>50</sup> Another idea is that discontinuity of nature is possible only under a common source of order. Order and complexity are linked to discontinuity. Last but not least, nature, as we have seen is a unifying agency. Discontinuity does not mean separateness. The complementarity and harmony that we see in nature shows that there must be some unifying principles and those unifying principles are metaphysical principles. This view of nature is fundamentally opposed to the Humean view of nature as a mosaic of discrete phenomena or logical atoms that, since Russell, has become one of the fundamental tenets of many contemporary philosophers.

The conclusion of this section should be that nature remains a mysterious reality that cannot be fully grasped by the human mind. To combine the five aspects or functions of nature identified in the Bahá'í writings and to understand their implications is already a significant challenge. However, even if we were to succeed in this task, something would remain elusive. There are two reasons for that. The first reason is that nature cannot be defined as an objective reality because we are part of it. As a part of nature we can see easily its objective manifestations, but other aspects can only be grasped through our subjectivity and our intuition. The second reason is that because nature is not just a physical reality but also an intelligible concept, the very idea of nature is deeply metaphysical, and relates directly to human spirituality. Because nature has meaning for us it has also a spiritual dimension. The understanding of this spiritual dimension depends deeply on the spiritual progress of humankind and, therefore, is likely to change with time. Nature cannot be captured by

---

50. On the debate about the question of a possible reduction of biology to physics, see Rosemberg and McShea, *Philosophy of Biology: A Contemporary Introduction* (London: Routledge, 2007), pp. 96-126.

any definition. As Bahá'u'lláh said: "It is endowed with a power whose reality men of learning fail to grasp."<sup>51</sup>

### 3. Elements of the Bahá'í Metaphysics of Nature

Metaphysics of nature operates at two levels. On one level, we find the general principles of Bahá'í metaphysics and how they relate or apply to metaphysics of nature. On another level, we find concepts that apply specifically to the metaphysics of nature such as interconnectedness, continuity and discontinuity, complexity, order, laws of nature, evolution, emergence, diversity, adaptation, entropy, chance, stochasticity or determinism. In the present section, after reviewing some of the key principles, we will deal mostly with interconnectedness, emergence and change.<sup>52</sup>

#### *Origin of the Universe*

In the history of Western intellectual tradition, the question of the origin of our universe has been an important point of contention and a source of conflict between science and religion. The Bahá'í understanding of the origin of the universe is fundamentally different from Christian and Islamic theology. Four points deserve attention. Firstly, the Bahá'í writings draw a sharp distinction between the origin of our universe, which might have a beginning in time, and God's creation, which is eternal. Secondly, God is considered as creator, but as his creation is eternal, the existence of God cannot be separated from the existence of his creation. Thirdly, God's act of creation is indirect as he uses the Spirit as his creative agent. Fourthly, our physical universe is an emanation from the spiritual world and, therefore, direct intervention of God in the genesis of our universe is not necessary.

The Bahá'í writings give two different accounts of the origin of the universe: one in which the universe has an origin in time and one in which it is eternal. Bahá'u'lláh says explicitly that both accounts are true and should be considered as complementary views of reality under the theory of intelligibility that we have already presented. The first account is purely naturalistic and fits well with the Big-bang scenario. In "The Tablet of Wisdom," Bahá'u'lláh writes:

The world of existence came into being through the heat generated from the interaction between the active force and that which is its recipient.<sup>53</sup>

---

51. TOB, p. 141.

52. Evolution is discussed in the longer version of this paper.

53. "Tablet of Wisdom," in *Writings of Baha'u'llah*, p. 139. In my view, the translation of this passage, allows for various interpretations. Baha'u'llah may have meant

In other words, a force has interacted with itself to create the energy<sup>54</sup> that set everything into motion. In that account, the universe has a beginning. However, even if our universe has a beginning, the process of creation is eternal. In the same tablet Bahá'u'lláh writes:

As regard thine assertions about the beginning of creation, this is a matter on which conceptions vary by reason of divergences in men's thoughts and opinions. Wert thou to assert that it has ever existed, and shall continue to exist, it would be true; or wert thou to affirm the same concept as is mentioned in the sacred Scripture, no doubt would there be about it, for it hath been revealed by God, the Lord of the worlds.<sup>55</sup>

This was clarified by 'Abdu'l-Bahá when he said:

The universe never had a beginning. From the point of view of essence it transforms itself.<sup>56</sup> God is eternal in essence and in time. He is his own existence and cause. This is why the material world is eternal in essence, for the power of God is eternal.<sup>57</sup>

The question of creation having a beginning or no beginning is treated by Bahá'u'lláh as two complementary views in an example typical of the theory of intelligibility, which says that the apprehension of reality requires the juxtaposition of different complementary views. Another important point is that the material world, but not necessarily this universe, is also eternal like the spiritual world. Materiality and spirituality are associated in eternity. Matter is an attribute of creation without which creation would not be complete and would not be able to attain its fundamental purpose. This makes the question of *ex nihilo* creation irrelevant.<sup>58</sup> This also has profound consequences for the concept of God as creator. God is not the great architect who has pondered on the blueprint of His creation and reviewed minute details before launching the project. Crea-

---

here that the universe has been created by one single force that has interacted with itself.

54. In the nineteenth century, the Arabic word for "heat" had a very broad meaning that covers the modern concept of "force" or "energy."

55. *Ibid.*, p. 139.

56. It is interesting to note that 'Abdu'l-Bahá defines the universe as an eternal self-transforming essence.

57. ADP, p. 106.

58. See Gerhard May (translated by A. S. Worrall), *Creatio Ex Nihilo: The Doctrine of 'Creation out of Nothing' in Early Christian Thought* (London: T&T Clark International, 1994).



tion is a manifestation of God in which nature is a very small component of a much larger structure. Although this small component throws some light on the larger structure, it does not allow us to grasp its scale and finality. God is creator in the sense of being ontologically anterior to the creation and non-contingent, whereas creation is contingent and dependent on a first cause. Once again, God is not the creator in the sense that one day He commenced the process of matter and space-time generation. He is the creator in the sense that we can say that we are the creators of our mind and of our thoughts. As we all know, we cannot stop thinking, and our thoughts tell us something about ourselves, but our thoughts are not us and are contingent in relation to us. The rationality that we see in the universe is a reflection of God's rationality. Science tells us how to read the mind of God.

### *The Agency of the Spirit*

The distance that the Bahá'í writings put between God and His creation is reinforced by the fact that God is only indirectly the creator, as He acts through an agent: the Spirit. The Spirit is described in the Bahá'í writings as the *First Emanation*, the *Primal Will*, the *Word of God* or Logos or simply Love. The Spirit links God to His creation like the rays of the sun emanate from the sun and can be reflected into a mirror. Bahá'u'lláh writes:

Thus does the Great Announcement<sup>59</sup> inform thee about this glorious structure.<sup>60</sup> Such as communicate the generating influence<sup>61</sup> and such as receive its impact are indeed created through the irresistible Word of God which is the Cause of the entire creation, while all else besides His Word are but the creatures and the effects thereof.<sup>62</sup>

And 'Abdu'l-Bahá comments:

The first emanation from God is the bounty<sup>63</sup> of the Kingdom, which emanates and is reflected in the reality of the creatures, like the light which emanates from the sun and is resplendent in creatures; and this bounty [emanation] which is the light, is re-

---

59. By "Great Announcement" we understand Bahá'u'lláh himself.

60. By "glorious structure" we understand the universe.

61. "Generating influence" refers to the active force mentioned by Bahá'u'lláh.

62. TOB, p. 140.

63. The Arabic word *'fadl'* can be translated alternatively by "bounty", "grace" or "emanation".

flected in infinite forms in the reality of all things, and specifies and individualizes itself according to the capacity, the worthiness, and the intrinsic value of things. . . .<sup>64</sup>

But even if the Spirit is the agent of creation, God remains the creator: "It is He Who hath called into being the whole of creation, Who hath caused every created thing to spring forth at his behest."<sup>65</sup>

The nature of the Spirit is of course something that is as mysterious as the nature of God. This cannot be explained in philosophical language but only in metaphorical terms. However, if the nature of the Spirit cannot be comprehended by the human mind, its manifestation can be and the Bahá'í writings teach that the manifestations of Spirit are as diverse as the various domains of God's creation and are responsible for the unity/discontinuity dialectic that we see in reality.

#### *The Two Processes of Emanation and Manifestation*

This agency of the Spirit cannot be understood without introducing two fundamental concepts of Bahá'í metaphysics: the concepts of emanation and manifestation. Whereas emanation has been used a great deal in Christian and Islamic philosophy (inspired by Neo-Platonism), the Bahá'í writings hold that the process of emanation alone cannot explain the relationship between God and His creation and must be completed by the process of manifestation. Emanation is what confers existence upon things. The physical world is an emanation of the spiritual world.<sup>66</sup> Essences are created by emanation. However, everything that exists manifests the Spirit. While emanation is a one-to-one relationship, manifestation can be a one-to-many relationship.<sup>67</sup> One property or entity can be manifested in many things, i.e., in contemporary philosophical parlance, we can have many instantiations of the same universal and these instantiations can have diverse forms, depending on the *locus* of manifestation. Without this process of manifestation, creation would be stillborn due to the impossibility of change or evolution. Things are endowed with potentialities and manifestation is the process by which these potentialities can be expressed.

Many allusions in the Bahá'í writings suggest that the processes of emanation and manifestation are two complementary aspects of reality which, due to the cognitive limitations of the human mind, cannot be per-

---

64 SAQ, p. 295.

65. *Gleaning from the Writings of Baha'u'llah* (Wilmette, IL: Baha'i Publishing Trust, 1983), p. 193

66. SAQ, p. 202.

67. SAQ, p. 295.

ceived in their unicity. The process of emanation is responsible for the continuity aspect of reality, while manifestation is responsible for its discontinuity aspect.

*Manifestations of the Spirit and Discontinuity in Reality*

Everything that exists is a mirror capable of reflecting the Spirit according to the capacity of its own essence. In each natural kingdom, the Spirit has its own manifestations according to the capacity and potentialities of that kingdom. This is the reason that 'Abdu'l-Bahá speaks of a mineral spirit, a vegetable spirit or an animal spirit. They are different manifestations of the same Spirit: the universal spirit, the Logos or Word of God.

Each manifestation of the spirit is responsible for the fundamental properties of that kingdom. For example, the mineral spirit is responsible for the force of cohesion that exists in matter and holds it together: the electro-magnetic force, the strong atomic force, the weak atomic force and gravity in modern parlance. Or rather, we can say that these four forces of the universe are the manifestation of a more fundamental spiritual force that embraces all aspects of God's creation and that 'Abdu'l-Bahá calls Love, i.e., the force that binds everything together, including God to His creation. In the vegetable kingdom, the Spirit manifests itself through the vegetable spirit, which confers biological life and vegetative functions, including the capacity of growth. Then, comes the animal spirit, which brings to life different potentialities, including powers of sensory perception. The human spirit confers to humanity rational and spiritual powers that allow individuals to free themselves from the prison of phenomenal appearances. 'Abdu'l-Bahá speaks even of a Spirit of Faith that allows humans to bind with their creator.

It is clear that when 'Abdu'l-Bahá makes these distinctions between the four kingdoms and the five sorts of spirit, his aim is not to give a taxonomic description of nature but rather to identify spiritual principles that will help us to understand human nature and our relationship with the spiritual dimension of reality. As usual, in order to understand the spiritual realm, he starts from observation of nature, and because the observation of natural realities helps us to understand spiritual realities, it cannot be completely dismissed as scientifically irrelevant. However, what is important here is the metaphysics beyond the science. It does not matter if there are four, five or six natural kingdoms. What is important is the type of relationships that exists between these different domains of reality. For example, a higher kingdom remains always dependent on a lower kingdom for its existence, or a higher kingdom always exemplifies a higher

degree of cooperation between its various components.<sup>68</sup> The metaphysical connotation of 'Abdu'l-Bahá's typology has also been remarked by Kitzing who writes:

In modern biology the kingdoms, originally introduced by Aristotle, are today used in a taxonomic sense; they designate distinct classes of organisms. 'Abdu'l-Bahá is obviously not concerned with a taxonomic distinction of biological classes, but with a hierarchy of increasingly complex faculties. . . . Thus in this context, the "kingdoms" do not designate taxonomically distinct classes but hierarchical levels.<sup>69</sup>

This does not mean that a theory of discontinuity of nature cannot be developed on these bases. However, such a theory would probably need more than four levels or kingdoms. A distinction would have to be made between the molecular level and the atomic level and below the atomic level it is not yet clear how many additional levels would be required. Each level would require a distinct and specific ontology to be harmonized and reconciled into a more general ontological framework. Each level would also require a specific form of scientific and metaphysical realism to understand its relational structure and its interconnection with the whole reality of the universe.

### *Interconnectedness*

Although nature manifests itself in a discontinuous manner, we have seen also that nature is a unifying agency. The principle of oneness of reality already mentioned cannot by itself explain the unifying role of nature. That requires principles that transcend the different sets of laws of nature operating at different levels of reality. The unifying role of nature is possible because everything in the universe, material and spiritual, is interconnected through a web of necessary relationships that play a major role in the working of reality. In fact, nature is made of two things: particulars or things in themselves and relationships that link particulars through their properties. 'Abdu'l-Bahá writes:

---

68. See 'Abdu'l-Bahá in *Compilation on Huqúqu'lláh*, in *Compilation of Compilations*, vol. 1, No 1159 (Mariborough, Victoria: Bahá'í Publications Australia, 1991), p. 504: "The higher a kingdom of creation on the arc of ascent, the more conspicuous are the signs and evidences of the truth that cooperation and reciprocity at the level of a higher order are greater than those that exist at the level of a lower order."

69. Kitzing in *Brown Evolution and Bahá'í Belief* (Los Angeles: Kalimat Press, 2001), pp. 198-9.

Reflect upon the inner realities of the universe, the secret wisdom involved, the enigmas, the inter-relationships, the rules that govern all. For every part is interconnected with every part by ties that are powerful and admit no imbalance, nor any slackening whatever.<sup>70</sup>

Everything in this universe is interconnected, and everything in the spiritual world is also interconnected. ‘Abdu’l-Bahá writes:

All phenomena are involved in all phenomena. Consider what a transcendent unity exists, that, from this standpoint, every monad is the expression of the whole creation; this is the law and order of the world of existence.<sup>71</sup>

Explaining the interconnectedness of things in nature is another important task of the Bahá'í philosophy of nature. The affirmation of the interconnectedness of everything in the universe has far-reaching metaphysical and ontological implications. It is incompatible with a Humean view of the world in which the universe is made of discrete self-contained events and passive particulars and in which regularities are the expression of contingent laws. Interconnectedness implies a world in which connections play a prominent role. This sort of connectedness implies that properties have active powers that bond particulars together in a non-contingent manner. This implies also a holistic view of nature: a view that sees nature as a web of necessary relations which has a natural as well as a metaphysical dimension (in opposition to a worldview of discrete events and a metaphysics of discreta). It implies a world, as Munford writes that “comes with a whole, connected system of properties.”<sup>72</sup> In such a system the understanding of relations is what gives us an understanding of the world. Particulars cannot be understood in abstraction from the web of relations in which they exist.

### *Emergence*

If we look carefully at what ‘Abdu’l-Bahá calls ‘spirits’, he is describing a set of properties that are specific to an ontological domain that he calls ‘kingdom.’ He explains that these properties cannot be the result of properties and laws existing at a lower level of reality; in other words, they are non-reducible. The vegetable kingdom is identified by a form of

---

70. *Selection from the Writings of ‘Abdu’l-Bahá*, (Haifa: Baha’i World Center, 1978), p. 157.

71. PRP, p. 168.

72. Stephen Munford, *Laws in Nature* (London: Routledge, 2004), p. 182.

life that includes a metabolism, the capacity for growth and a form of reproduction. All these properties of the vegetable kingdom are absent from the mineral kingdom. Each level of nature is characterized by new properties: the cohesion of matter, vegetative life, faculties of perception, reflexive consciousness, and the like. This is exactly the concept of emergence that is now assuming paramount importance within our modern understanding of complex systems.

At the time of 'Abdu'l-Bahá, Persian or Arabic did not have a word for '*emergence*', but as we have seen, it does not mean that the idea did not exist. In fact, Bahá'u'lláh and 'Abdu'l-Bahá use another word; a word so obvious and so ubiquitous that its fundamental meaning escapes most readers. That word is '*manifestation*'. It is true that the word '*manifestation*' has broader scope than '*emergence*'. '*Manifestation*' can apply to God Himself, or to His representative on earth, or to the human soul. However, when '*manifestation*' applies to natural phenomena, it describes exactly what modern science and philosophy call '*emergence*'. Another good example of this can be found in 'Abdu'l-Bahá's writings, when he says that '*intelligence*' (meaning the mind) is "manifested" gradually in the body and that the body must grow to a certain level of complexity and maturity to manifest fully the potential of intelligence, as we can see with young children who grow in intelligence when they are bodily developed and mature.<sup>73</sup> The important point is that both Bahá'u'lláh and 'Abdu'l-Bahá link the concept of emergence with the idea of complexity. When a threshold of complexity is passed, new properties naturally emerge, not as the result of the interaction of particulars but because they already exist potentially in the universe. Other examples of other forms of emergence can be found in 'Abdu'l-Bahá's writings when he says:

. . . for example the seed, which is a single thing possessing the vegetative perfection, which it manifests in infinite forms, resolving itself into branches, leaves, flowers and fruits: this is called appearance in manifestation. . . .<sup>74</sup>

In fact, a careful examination of the Bahá'í writings shows that they refer to two types of emergence: (a) emergence that occurs between different levels of reality (kingdoms) such as, for example, the emergence of life out of the mineral kingdom; and (b) emergence between different levels of complexity within the same level of organization of nature, as we

---

<sup>73</sup>. *Selection from the Writings of 'Abdu'l-Bahá* (Haifa: Baha'i World Centre, 1978), p. 285.

<sup>74</sup>. SAQ, p. 295.

have seen with the example of the branches and leaves manifested out of the seed. I will call the first type of emergence *ontological emergence* and the second type *systemic emergence*. The difference between ontological and systemic emergence is that while each level of ontological emergence requires new sets of laws of nature in addition to the existing ones, systemic emergence operates under the same set of laws.

Since the late 1960s and 1970s, various new mathematical theories permit the study of nonlinear systems as well as the understanding of their evolution and of the conditions of their dynamic stability. These new investigative techniques include chaos theories, catastrophe theory, genetic algorithms, cellular automata, and others. They show that, as the Bahá'í writings predicted, complexity is not something added to our universe but something inbuilt in it from its very beginning and one of its key characteristics. Understanding how complexity and order appear in a chaotic system involves almost immediately the idea of emergence. Significant progress has been made in understanding systemic emergence but little in understanding ontological emergence. The emergence of life and of consciousness remains a mystery despite all the research in artificial life and artificial intelligence based on computational emergence.

There is a growing consensus among theoreticians of emergence that for an emergent phenomenon to be recognized as such, it must at least display five characteristics: complexity, irreducibility, unpredictability, conceptual novelty and holism. Complexity means that emergence occurs only in systems having a certain degree of complexity and that emergence is directional, always going from one level of complexity to a higher degree of complexity. Irreducibility and unpredictability mean that new emergent properties cannot be explained by the properties of the level from which they emerge and that their appearance cannot be predicted by the properties of that level. Novelty means that new emerging structures display new features and properties that bear limited resemblance with lower structures and that require different conceptual tools for their analysis (conceptual novelty). Holism means that properties are the properties of the system, not properties of its components. Natural structures are not determined by the structure of the system components but by their level of complexity which implies new information not existing at a lower level. This means that nature (if we consider the universe as a system) has properties distinct from its components or subsystems.

This does not mean that every scientist or philosopher is ready to embrace emergentism. The concept of emergence is still so much in need of clarification that its epistemological status remains in question. Once again we believe that this lack of clarity is due to the lack of a supportive ontology that is integrated with the metaphysical framework of philoso-

phy of nature. A first conceptual difficulty is to find a definition of emergence. This task has proved incredibly difficult. Workable definitions of emergence are rare phenomena, whilst weak definitions are ubiquitous. Then, there comes the difficulty of defining the different organizational levels of nature. Life seems easy to distinguish from nonorganic matter, but what about viruses and prions? Do prokaryotes and eukaryotes represent different levels of organization of life? Do fungi and plants belong to the same level of complexity? How does scale in nature relate to complexity? Sub-atomic physics is different from atomic physics such as chemistry partially because they operate on different scales.

Here we should remember that we are looking for a metaphysical theory of emergence and metaphysics cannot solve scientific problems; it can only provide a better ontology that will bring greater clarity to the interpretation of scientific theories. But it cannot remedy the deficiency of such theories. Finding valid examples of emergence in natural processes that can be analysed in a scientific manner is the task of science, but the validity of a metaphysical theory would not rest on such examples. A metaphysical theory would be only remotely concerned by the problem of emergence of new properties between different levels of complexity within the same system of nature. A metaphysical theory is more about emergence of a higher ontological level out of a lower ontological level. Although many scientists entertain the hope, or the fancy, that one day they will be able to explain the emergence of life or consciousness in purely naturalist terms, we think that this is impossible. Only ontological emergence is of significance for Bahá'í metaphysics; systemic emergence does not play any role.

#### *Properties and Necessary Relations*

Finally, one of the most important concepts of Bahá'í metaphysics is the concept of necessary relation. Besides the fact that essences are vehicles for fundamental properties of things and, therefore, determine the logical and intelligible structure of reality, little can be known about essences. We know about essences through the properties of things. From a philosophical viewpoint, the study of these properties and the necessary relations that they determine are far more important than knowing what essences in themselves are. As already said, necessary relations should be viewed as the central concept of Bahá'í ontology.

Natural objects have properties and dispositions that determine what they are and what sort of bounds or relations, under the universal law of attraction and affinity, they can forge with other natural objects. It means that there can be two complementary views of nature. The first one is a description of nature as a structure made of natural objects in which each



object is described precisely in terms of properties and behaviours. This view of nature is very powerful as long as natural objects are discrete, relatively simple and interacting with a limited number of other objects as it is the case in fundamental physics. This is the view of nature that we find in Western science. The second complementary view of nature is a view that takes a holistic approach and sees nature as a web of necessary and accidental relations between natural objects. This view is very powerful when applied to complex systems of natural objects such as the weather or an ecological system. This is the view that Bahá'í philosophy should try to promote while recognizing that the first view is complementary and should not be neglected.

The important point to grasp is that relations are relatively independent in their expression and causal powers from the properties that generate them. A natural object A has a property (a) and a natural object B has a property (b). The properties (a) and (b) determine a necessary relation 'x' between A and B. However, in many cases 'x' can be explained neither by (a) nor (b). The relation that binds things together is made of information different in nature from the information carried by the properties of A and B. In other words, relations cannot be reduced to properties. They are distinct from the causing power of any of the two natural objects because the causality that results from the relation is distinct from the causal powers of (a) and (b). Necessary relations must be studied for their own sake because they play a crucial role in the architecture of the system of nature and are the unifying agency of reality, as discussed earlier.

One of the great advantages of the concept of necessary relations is that it is a universal concept that applies to all fields of human knowledge and cognition. Necessary relations not only apply to all natural objects existing in the universe but encompass all metaphysical and spiritual worlds. They apply to inanimate objects as well as to living beings. While science is not a unified activity because the ontological discontinuity of nature prevents the existence of a single scientific methodology, on a philosophical level, necessary relations provide a unifying concept that can give a unifying view of all scientific activities and knowledge. It also helps to understand the origin of order in the universe and to understand that laws of nature are simply the mathematical formulation of some of these necessary relations. As a consequence necessary relations also explain complexity. Physics and chemistry can be based on a relatively limited number of 'laws' because the relations existing between physical objects are relatively few. On the other hand, it is far more difficult to formulate biological laws because biological phenomena are far more complex than physical or chemical phenomena. When we come to the study of animals, this study must be put in the perspective of the vast web of re-

lations that link and interconnect all living beings in a community that itself extends not only to plants but also to geological and meteorological systems that form the biosphere.

Because necessary relations are not limited to the physical world, they also apply to human activities. Human societies are based on necessary relations that we try to formulate through psychology, anthropology, sociology and political science. Economics, with its theory of markets and price formation, is a good example of necessary relations applied to human activities. Ethics itself could not exist without the deep belief in the existence of a number of fundamental relations in human society determined by human nature. Because human nature is not just physical but also spiritual, human 'properties', or rather attributes, are not just biological but also spiritual. Spiritual laws that govern our spiritual existence are born from the necessary relations existing between this universe and the spiritual world. Finally, as 'Abdu'l-Bahá seems to show, the concept of necessary relations is what unifies science, philosophy and religion.

Necessary relations are not only a universal concept that integrates all areas of human knowledge and cognition, but is also a concept that provides a tool that can help formulating in a coherent manner philosophical or ontological theories, addressing some of the mysteries of our universe. For example, the origin of numbers can be explained in terms of relations between sets. The existence of physical constants in the universe can also be explained the same way. This is also true for the existence of the forces of physics or non-local connectedness as demonstrated in Aspect's experiment. The space-time continuum can be seen as being generated by necessary relationships existing between natural objects or simply as the sum of all these relations. Necessary relations probably play a great role in all emergent phenomena. They explain why the different kingdoms of nature seem to unfold with a ready-made architecture that makes everything fit in its place. Necessary relations certainly play a role in the explanation of biological evolution, and particularly in the explanation of biological convergence between species. The dolphin, a mammal that shares the same environment as fishes, and looks like a fish, is a good example. We are discovering that forms in nature play a great role also in evolution.<sup>75</sup> Nature knows how to design complex geometrical forms such as Fibonacci spirals, Bénard cells, spiral wave patterns and uses re-

---

75. On the role of forms in biology see D'Arcy Wentworth Thompson and John Tyler Bonner *On Growth and Forms* (New York: Dover Publications, 1994 (originally published in 1917 by Cambridge Univ. Press)); Philip Ball, *The Self-Made Tapestry: Pattern Formation in Nature* (Oxford: Oxford Univ. Press, 2001); Yves Bouligand, ed., *Les Sciences de la Forme Aujourd'hui* (Paris: Seuil, 1994); and Paul Bourguine and Annick Lesne, *Morphogénèse: L'Origine des Formes* (Paris: Belin, 2006).

petitive fractal geometry in very effective ways. Forms play a great role in determining the properties of molecules, and they probably play an important role in determining the evolutionary path of living beings. The emergence of regular and repetitive patterns seems to be a fundamental characteristic of nature and can be explained by the concept of necessary relations.

*Independent scholar*