

Chapter 2

Chance and Necessity

Abstract In *Chance and Necessity* Monod masterfully spans the divide between humanities and sciences. For Monod, unlike subsequent renowned popularisers, *science* was one thing but what science *evoked* was quite another; he claimed that we should take the logic of science as far as it allowed. In this chapter, I revisit Monod's reflections on Bergson—as did the famous evolutionary biologist Mayr—and I suggest that this philosopher's vitalist theory should be reconsidered in the light of modern Biology, as should Driesch's Embriology. The thesis on the need to give similar importance to both the parts of a biological entity as to the interactions between them is discussed within a wider context.

As soon as I could lay my hands on it, I read *Chance and Necessity* (Monod 1972) with fervour. The fourth edition, published in Spanish by Seix Barral, is a gem that I frequently reread in small snippets, intending to digest it slowly. The work is subtitled *An Essay on the Natural Philosophy of Modern Biology*. I wonder how many scientists of my generation and beyond have been influenced by its enormous intellectual scope. I honestly cannot answer that, although I fear that it is far fewer than it should be. Monod was perfectly aware that his book did not respond to a systematic treatise of Philosophy of Science nor a formal work around the crucial experiments that led to the birth of Molecular Biology. Monod's eagerness, like many other continental scientists, was to do with transcending reflections on his own research to include the layman's thoughts about life. Monod says:

Indeed we should avoid confusing the ideas that science suggests with science itself; but we must take the conclusions that science draws to the limit if we are to reveal their full significance.

Monod clearly airs something that subsequent scientists have not envisaged with such precision or demarcation in similar written essays: the distinction between what science *is* and what science *evokes*. However he is also in favour of taking the evocation of science as far as possible. This is not a worthless intellectual exercise. Science has the same right as other forms of thinking to interpret the world and to go as far as its rationality allows. This exercise is not futile as

it allows free competition with other systems of thought—especially Philosophy, Religion and Art—to propose consistent explanations for the world. Nevertheless, this is neither a dominant nor domineering way of thinking because after a new scientific discovery, old problems may acquire a new interpretive light, however naive or harmless this finding might be. One must be there to transcend the discovery, and help place it in the context of modern culture. Monod assumed this task, aware that he could be treated as naive by philosophers and with distrust by scientists.

For Monod, vitalism and its scientific explanation of life is not an outdated, dark or oblivious philosophy. Monod tries to understand the underlying message in Bergson's *Creative Evolution*, which he labels as metaphysical vitalism. All the same he acknowledges that there is something intriguing in the French philosopher's *vital impetus* or *vital force*—the engine of evolution. This force is responsible for life's ability to tame and to organise the inanimate. We might think such a philosophy to be finalistic, with opportune determination for final and efficient causes leading to sustain a relationship between creationism and metaphysical vitalism. Not at all. We may wonder in hindsight as to the nature of that vital force, as well as trying to understand whether Bergson would have been satisfied by the current theoretical and empirical knowledge about the cell and its functioning, thus being perfectly integrated in science. I like to imagine that it would be so, for this thesis goes in favour of bridging the gap between philosophical and scientific rationality. With the insufficient conceptual and empirical tools of his time, Bergson was unable to give a scientific answer to that question. But he knew that there must be something fundamental in life leading to unfold states or processes that were unique with respect to other things in the world. In the absence of such an explanation, the philosopher grasped at an intangible principle. As a working hypothesis it was not bad, because above all there was a need to find some explanation of its uniqueness, particularly related to the domination and control of the inanimate. Many times we have resorted to the formulation of entities without immediate or available physical correlates, which have become the basis for an explanation of world phenomena: force, inertia, genes, the interaction between components, to name but a few.

In evolution, Bergson recognises that man represents a supreme state; however he does so under total indeterminacy. We are a wonderful manifestation of the creative force, but just as we are here, we might well not be. We may well deliberate over the origin of this vital force just as science ponders on the origin of life. Once life appears, so does this force. In fact, they would be equivalent. To provide a theory that explains the origin of life would also explain the origin of this force. But such a theory was not available in his time, and indeed today we are still engaged in this endeavour. According to Bergson, evolution has led to man in an indeterminate way, and man is an entity that demonstrates the total freedom of this creative force. Such metaphysics is not incompatible with science or the explanation of the origin and evolution of life.

Man is most certainly a product of evolution. For Bergson, however, our rational intelligence is something that has allowed us to dominate nature. But this

quality is not enough to grasp what life is. According to this philosopher, such apprehension can occur by resorting to another general quality which the vital force bestows on every living being: instinct. Instinct can endow man with the intuition needed to capture life in all its dimensions. This thesis cannot necessarily be shared as it is a retrospective view glimpsed from current science. Because human intelligence, as we know it, is more than intellect adapted to dominating things or controlling the world. Intelligence is more than rationality. Intuition is one of myriad manifestations of intelligence. And man, in all the uniqueness implicit in deploying this intelligence, is a being that can look back on the path that has generated him. We know more or less where we stand on the sinuous tree of life and at which point this branch appeared. We are quickly approaching the point at which life will become intelligible, a point Bergson believed could not be reached by rationality alone. My question, again, is whether he would maintain this opinion on learning of all the new advances that have occurred during the twentieth century around the cell and the evolution of organisms.

And what of Hans A.E. Driesch's *entelechy* or vital force? For this scientist, who has also been called a vitalist, the cell is not captured in its components. When we delve into the innermost elements, we will discover components or processes that clearly assimilate physical and chemical phenomena. But it is not possible to understand what the cell is, or describe it by such material components. For Driesch it must hold an entity which he qualifies as non-spatial, intensive and qualitative and he had to resort to this explanation to state that a cell, the smallest unit of life, differs from an inert physical entity. It is true that the cell is composed of extensive and quantitative spatial entities, but their mere combination cannot capture the actual essence of the cell. There is something else, a property that endows its essence: the quality of life. Driesch, like Bergson, was far from catching a glimpse of such an entity, which had the remarkable ability, unique in the world, to evolve and modify the beings it imbued.

In 2002, during the Walter Arndt conference on the autonomy of biology, in a fey attempt to justify the issues raised by the vitalist authors, Ernst Mayr said that:

It would be ahistorical to ridicule vitalists. When one reads the writings of one of the leading vitalists like Driesch one is forced to agree with him that many of the basic problems of Biology simply cannot be solved by a Philosophy as that of Descartes, in which the organism is simply considered a machine. The logic of the critique of the vitalists was impeccable. But all their efforts to find a scientific answer to all the so-called vitalistic phenomena were failures. Rejecting the philosophy of reductionism is not an attack on analysis. No complex system can be understood except through careful analysis. However the interactions of the components must be considered as much as the properties of the isolated components.

Mayr could not have given greater credit to the vitalists. To begin with he claims that they were not willing to assume that a living being, a cell in its simplest expression, was a machine. The Cartesian conception equating a machine with a live being is rejected. According to Mayr, this equivalence is the cornerstone of a reductionist philosophy that vitalist scientists like Driesch were unwilling to accept. Even in retrospect, we can now clearly state that if a living being were like a machine, it would be a very special one indeed. It has a particular

ability to overcome problems and defects and still function despite them, as long as they are not overly destructive. But unfortunately vitalist scientists had a monumental problem: even with the conceptual tools, techniques and empirical data of their day, they did not find a convincing scientific explanation of what a living entity might be. The value that the analytical study of living things to shed light on the intrinsic complexity associated with them was not denied. Indeed, Mayr weighs up the value of the analysis in the right measure. However akin to the former vitalists, he believes that life should also be studied from other approaches. Mayr makes his claim about the vitalists because they are forerunners of a thesis he finds attractive: Biology is an autonomous science. Furthermore, this scientist tries to put this autonomy into the current context. And that is when he introduces the very modern notion of *interaction* between components. For Mayr interactions are as important as the components themselves. Therefore, the following question should be framed: do the interactions of the components constitute a key element of the whole, one that is essential to give a comprehensive explanation of that entity we call life? Is the interaction, in a generic and qualitative sense, the vital force so keenly sought by Bergson or Driesch's entelechy? Most probably. This work is an intellectual journey guided by the notion that interaction is characteristic of the complex phenomena occurring in nature, associated to life and, particularly, to the cell, its basic unit. Emergent entities arise from interaction, and these can provide new levels of organisation that obey their own logic and their own laws. Life is an emergent phenomenon and represents a level of organisation with its own laws, which are required to understand the elements that compose it. The historical weight given to this issue by holistic biologists and philosophers is such that we could almost say it has been a secular tradition, running in parallel to others of a more analytical nature. An ever present tradition, critical and in minority, but unrelenting. A tradition that has been waiting for its moment of glory. Several factors have had to materialise to be able to affirm that the time for biological holism has come. Biology, or some of its traditions which are little inclined to analysis, has been a flagship for emergentism, upholding the thesis that each level of organisation has its own laws. Indeed, biology has instilled such a philosophy in other sciences, including Physics.

Reference

Monod J (1972) *El azar y la necesidad*. Barral Editores, Barcelona



<http://www.springer.com/978-3-319-16969-9>

The Calculus of Life

Towards a Theory of Life

Moya, A.

2015, XIII, 95 p., Softcover

ISBN: 978-3-319-16969-9