

LIFE, SCIENCE, AND MEANING SOME LOGICAL CONSIDERATIONS

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ABSTRACT: Both science and theology involve philosophy. They both involve reasoned argument, evaluation of possible explanations, clarification of concepts, ways of interpreting experience, understanding the present significance of what has gone before us, and other such eminently philosophical tasks. They both involve philosophy especially when they enter into dialogue with each other. In fact, they involve philosophical thinking even when they may not be aware of it. In this paper I will explore a specific area of philosophy that is particularly important as a bridge between theology and science. I am referring to the area of meaning. Questions regarding meaning are fundamental because whatever is said about the nature of life, by scientists, by theologians, or by anyone else, must be expressed in meaningful words. Meaning is like the ground we walk on. It constitutes what we need so as to proceed with our activity. Without solid ground under our feet, we cannot go anywhere.

KEY WORDS: life, science, meaning, logic, analytic philosophy.

Vida, Ciencia y significado de algunas consideraciones lógicas

RESUMEN: Tanto la ciencia como la teología implican filosofía. Ambas implican argumento razonado, la evaluación de las posibles explicaciones, la aclaración de conceptos, formas de interpretar la experiencia, la comprensión del significado actual de lo que ha ido antes que nosotros, y otras tareas tales eminentemente filosóficas. Ambos implican la filosofía, especialmente cuando entran en diálogo con los demás. De hecho, implican el pensamiento filosófico, aun cuando no sean conscientes de ello. En este artículo voy a explorar un área específica de la filosofía que es particularmente importante como un puente entre la teología y la ciencia. Me refiero a la zona del significado. Las preguntas relacionadas con significado son fundamentales porque todo lo que se dice acerca de la naturaleza de la vida, por los científicos, por los teólogos, o por cualquier otra persona, deben ser expresadas en palabras con sentido. El sentido es como el suelo que pisamos. Constituye lo que necesitamos para proceder con nuestra actividad. Sin tierra firme bajo nuestros pies, no podemos ir a ninguna parte.

PALABRAS CLAVE: vida, ciencia, significado, filosofía analítica.

Many philosophers have investigated at length the nature of meaning, especially these last decades, and some have concentrated on the way new scientific discoveries affect the meaning of some important terms we use in everyday life. In the following paragraphs, I will deal with some of this work, focusing especially on one argument that emerged from the area of logic and philosophy of language and then had a considerable effect in the area of philosophy of science and culture. The paper has four sections. I will first present the logical argument itself in summary form, and then in section two I will show how this argument was extended and applied to other areas. In section three, I will focus on one specific application of this argument: I will explore how it affects the scientific inquiry about the nature of life. And finally I will present an evaluation. Overall, this paper is intended to clarify not only the nature of life but also the relation between the two expressions «the nature of life» and «the meaning of life».

1. THE LOGICAL ARGUMENT

The main argument I want to focus on in this paper was first developed in its present form about thirty years ago. It was the fruit of the work of two philosophers of logic and language: Saul Kripke and Hilary Putnam, both American, one at Princeton University, and the other at Harvard. Kripke's most famous book *Naming and Necessity* appeared in 1980. Putnam's most famous work is probably the collection of papers entitled *Reason, Truth, and History*, which contains papers written between 1978 and 1980.

These two philosophers worked on various topics and their work often shows areas of common interest, especially as regards what is known as the causal theory of reference. This is a philosophical theory that is meant to explain the function of names within language. Names are fundamental constituents of language. Without them language cannot function. Before Kripke and Putnam, most philosophers used to think that a name is a short way of indicating a description. They used to think, for instance, that the name Aristotle functions within language as a short way of saying «the pupil of Plato who eventually became one of the most famous philosophers of Ancient Greece». The name was a kind of abbreviation, a way of avoiding a long sentence by using just one word. Of course, there are other descriptions of Aristotle, but the general idea used to be that all these descriptions are indicated by that one name. Hence, in general, a name is nothing more than a substitute for a description or a set of descriptions. Early on in his career, Kripke realized that there is something wrong with this view. He claimed that a name has a different role within language. His main argument was that we can easily imagine counterfactual states of affairs concerning Aristotle. These situations can indeed be imagined and expressed using the name Aristotle. For instance, we find no problem in imagining that Aristotle, as a boy, could have never attended Plato's Athenaeum. We find no problem in saying that this was a possible state of affairs, that it could have happened, even though it differs from what actually happened. Kripke noticed that, in such accounts of possible states of affairs, the name Aristotle is certainly not functioning as a description but as something else. The name Aristotle must be linked directly, as it were, to the man Aristotle, while the descriptions come later. This is why we can express the idea that Aristotle could have been different from what he actually was. The description is one thing. The name is another.

From such considerations, Kripke concluded that a name is best seen as a term that is attached to, or associated with, an object by a community of speakers at some distant point in the past. The name, therefore, is not a substitute for a description but a substitute for the object itself. This is, in simple terms, the content of his causal theory of reference. Putnam developed the same idea further and, together with Kripke, arrived at some very interesting conclusions regarding scientific discoveries. Putnam's inquiry focused not on names in general but on words that stand for what in philosophy are known as natural kinds. A kind here corresponds to a group of individuals that share some common attributes; and

we say that a kind is natural when such grouping does not depend on human classification but is there to be discovered. In normal language we have innumerable words that refer to such natural kinds. One example used a lot by Putnam was the word «water». Since this word functions as a name, the previous argument applies. Hence, we cannot say that 'water' is just a substitute for the various descriptions of water. In other words, the word «water» is not a substitute for: A liquid that is colourless, odourless, good for drinking, falls from the sky and gathers in rivers and lakes, etc. Just as the name «Aristotle» must refer to the individual man, irrespective of the various descriptions we have of him, so also with the name «water». Putnam concluded that there must be an essence of water to which the word «water» refers. And since, as historians tell us, in the early 1800s, scientists discovered that water is H_2O , Putnam and Kripke argued that the solution is clear. Once the molecular structure of water was discovered, the question about the role of the word «water» was resolved. Now we know that water is H_2O . This is not just another description like the others. This is the real essence of water. Any sample of water, anywhere in the universe, that is not H_2O is not water—even if it satisfies all the other descriptions.

2. THE WIDER RELEVANCE OF THE ARGUMENT

This argument may seem somewhat academic, of interest mainly to logicians, and quite far away from the mainstream concerns of broader philosophy and its application to real life. Its relevance, however, was soon noticed by many philosophers, and it generated various debates. Many commentators realized that this argument exposes and articulates a fundamental division that exists in our culture at its deepest level, a fundamental division that has been with us for the last four hundred years or so. The division I am referring to is the one between the image of the world that we derive from science and the image of the world that we spontaneously assume in our everyday thinking and conversation. Some clashes between these two images have been very dramatic: the best example here is probably the one involving Galileo. The Kripke-Putnam argument is related to the Galileo story in an interesting way. As we know, Galileo was instrumental in the remarkable shift from a geocentric mentality to a heliocentric one. Now just as Galileo, with his use of the telescope, showed that the real motion of the Sun is not what appears immediately to our eyes, so also the Kripke-Putnam argument shows that the real nature of water is not its liquidity, or its being good for drinking, or its having the other immediately perceptible features. It is rather what science tells us it is: H_2O .

What we have in such cases is in fact a kind of substitution. We shift from an incorrect idea of water to the correct one. Water is just one example. There are many other examples illustrating how we sometimes discover that our everyday image of the world does not agree with the image we obtain from science. The American philosopher Wilfred Sellars coined the expressions «the

manifest image» and «the scientific image» (Sellars 1963). He argued that the worldview of the common person does not correspond to the scientific account of the world because these two views correspond to related but distinct ways of understanding. The manifest image is constructed out of two basic units: Things and persons. The scientific image, on the contrary, adds to this initial framework a number of theoretical entities, and becomes thereby a rival to the manifest image. The manifest image remains pragmatically useful for everyday needs, but proves inadequate when compared with the scientific one. The tension that arises between these two images can be resolved, according to some of Sellars's followers, in only one way: By abandoning the everyday image and substituting it by the scientific one. This kind of argument, of course, is not without a long history. Traces of it are evident in early modern philosophy, especially in the works of John Locke, who distinguished between real essence and nominal essence (Locke 1690/1975, p. 614). For Locke, the nominal essence of a thing is the idea that we have of that thing. For instance, as regards water, the nominal essence is the idea of water as a liquid that is colourless, odourless, good to drink, and so on. The term «real essence» refers to the hidden reality of the thing. We do not perceive this hidden real essence, but we can arrive at it via our faculty of the understanding. The real essence is that which explains the nominal essence. These distinctions proposed by Locke constitute the main elements of the more refined and carefully expressed argument presented by Kripke and Putnam. The basic point, expressed concisely, is that science trumps ordinary thought.

3. THE ARGUMENT APPLIED TO THE QUESTION OF LIFE

Now let us come to our central question, the question of life. Life is, in a sense, somewhat like water. We encounter it, as it were, and experience it in all kinds of different ways, and is not something alien, reserved only for the few. Moreover, what chemists have done as regards water, biologists have apparently done as regards life. In other words, a micro-explanation of life is now apparently available. And this micro-explanation can therefore be presented as the real answer to the question «what is life?». It can be presented as the answer that should trump all other answers. Let us consider the various steps of this reasoning in some more detail.

The project of arriving at the hidden, deep nature of life has a very long history. Ancient views were dominated by two major trends, one associated with Democritus and the other with Aristotle. Democritus started from the observation that life seems to go with heat and autonomous motion. He therefore proposed a materialist view according to which life is made up of fire-atoms. As opposed to this, Aristotle was convinced that things have both a material aspect and an intelligible aspect, and that it is the grasping of the latter aspect that ensures our understanding of the thing. Hence he was respectful of the way we understand and classify things in normal circumstances, because for him this indicated the

basic features of reality itself. He therefore argued that life is not just matter, as Democritus had argued, but matter in a specific form: informed matter. The specific form that makes some matter a living thing he called the soul, and he then proceeded by analysing the nature of soul. About fifteen centuries later, in the medieval schools, Albert the Great started to highlight the fact that, for some specific questions regarding biology, like the question about how plants grow, we should not expect to arrive at correct answers by pure deductive thinking. We need careful observation. His pupil Thomas Aquinas endorsed most of this teaching and also most of what Aristotle had said as well, but tried to highlight also the interesting idea, extensively used by Augustine, that the world of things is not passive but active. In other words, for him God created the world as intrinsically active, as a realm full of potentialities, including the potential to generate life.

The modern period saw a return to the idea that for an explanation of life it should be enough to resort to particles or microstates. For this kind of project, Descartes is typical. According to him, the correct explanation of any given material thing, organic or inorganic, involved seeing it as a collection of particles in motion. All living things are complex machines, with the exception of human beings, who are a combination of two substances: A material substance, made up of particles, and a thinking substance. This view did not solve the problem of explaining the difference between a living thing and a non-living thing. It just situated the problem within a new context. It gave inquiry a new direction by suggesting that the difference between living and non-living things is not a difference in kind but a difference in degree—in the degree of complexity—. In the seventeenth century, this point started to face a challenge arising from a new view that came to be called vitalism. This view held that living things have something extra: an immaterial life-principle that forever eludes the inquisitive eye of natural science. Many scientists and philosophers found this position at first appealing, but enthusiasm eventually dwindled, and by the mid-twentieth century no prominent defenders of this position remained. Charles Darwin was not directly interested in the distinction between living and non-living things; he was more interested in the way living systems evolve and in the way this process can give rise to novelties. With the rapid development of biochemistry in the late twentieth century, especially after the 1953 discovery of the structure of DNA, Darwin's seminal ideas found new strength, and the question of how life might have emerged from non-living matter started to be asked in earnest in order to bridge the gap between living and non-living things.

Where are we at present? Recent literature on the nature of life indicates that there are various lines of inquiry being explored, but, for the argument I want to present in this paper, it is enough to focus on two main areas only: the inquiry related to emergence, and the one regarding the criteria for life. In 1944, Erwin Schrödinger, physicist and one of the founding fathers of quantum mechanics, published the book *What is Life?* This work offered some proposals regarding negative entropy and molecular information, which are two basic requirements

for the understanding of how life might have emerged from non-living matter. Schrödinger's ideas proved very useful and inspiring for further research into the nature of what we now call the genetic code. His proposal was that, given the state of science at his time, there had to be some molecular material that showed not just regular repetitive order, like what we see in crystals, but a higher-level order that would contain the coded information of heredity within the pattern of its molecular sub-units. Here we see therefore an explicit reference to an account of life in terms of emergent properties—in terms of properties which arise out of more fundamental properties and yet cannot be reduced totally to these more fundamental properties. Of course, many questions remain unanswered in this area, but the basic idea of considering life as informed matter, somewhat like what Aristotle had suggested, has proved to be a progressive research programme, valuable at various levels of inquiry.

As regards the inquiry dealing with the criteria for life, the main focus concerns the list of necessary and sufficient conditions for something to be alive. There is no clear consensus regarding this list, but the majority view highlights the following seven essential features that distinguish between living and non-living things. For a thing to be living, it must show (1) metabolism (the transformation of energy by conversion of chemicals so as to produce specific phenomena associated with the features that follow); (2) homeostasis (the regulation of the internal environment to maintain a constant state); (3) organization (in other words, the thing should be composed of parts that show functional cooperation between them); (4) growth (the capacity to increase in size in a regular and organized way that is not simply the accumulation of matter); (5) adaptation (the ability to change over time in response to the environment, an ability that allows the process of evolution through environmental filtering); (6) at least some form of response to external stimuli (the ability to change its state and sometimes also its location because of changes in its environment), and (7) reproduction (the ability to produce new individuals of the same kind).

Although these seven criteria offer a reasonably clear idea in scientific terms of what distinguishes between life and non-life, several areas of disagreement between scientists remain. For instance there is a lack of clarity as regards the way we should handle cases where not all the above criteria are satisfied. The central question here is: How *many* of these features need to be manifested by a thing for it to be classifiable as living? The definite dividing line between living and non-living is yet to be made clear. There seem to be various examples of microscopic entities that satisfy some of these seven criteria but not others. For instance, viruses are neither self-replicating regular crystals, which would indicate that they were non-living things, nor the kind of living cells that we find everywhere in the organic world. They are somewhere in between. What we know is that they are small infectious entities that can replicate only inside a living cell. So they resemble living organisms in that they have genes and evolve by natural selection, but they are unlike living organisms because they do not have their own metabolism but need the host cell to produce what they need.

Are they living or non-living? Or do they belong to a third category, which we have not thought of yet? At present, there is no consensus on this point. For people interested in the macroscopic aspects of the organic world, this lack of consensus about viruses may seem a marginal puzzle. The taxonomic problem here however is not a minor one. The disagreement is manifesting a serious gap in our knowledge because viruses are the most abundant self-replicating, organized entity on the planet —according to some scientists, there are more viruses than all other biological entities put together (Crowford 2011, p. 16).

Another source of current disagreement regards the very notion of individual. In purely philosophical terms, an individual is best described by the expression «one of a kind». All our judgments involve propositions that are about some individuals and the kinds to which they belong. In fact, seeing the world as made up of individuals, understood in this way, is a logical requirement. The challenge we are talking about here is the one of determining which individuals of the ones that have a role within our conceptual scheme are indeed the *real* individuals. It is the challenge of determining which individuals exist as such independently of our way of classification, the challenge of determining which individuals are so whether we like it or not. For centuries, the real biological individuals were taken to be individual organisms taken singly, for instance individual dogs, or individual cats. This is one of the most important Aristotelian breakthroughs that left its mark on thinking for many centuries. But now, especially after the merging of evolutionary biology with biochemistry and genetics, the very idea of a biological individual has become controversial. Typical new questions include the following: In evolution, are the units of selection the individual organisms taken singly (such as single *Drosophila* flies), or are the units of selection the genes that make them up? Can a group of organisms be a biological individual in its own right? Can a species as a whole be an individual? Vagueness contaminates most of these questions. Recent studies in fact have uncovered biological entities that cannot be classified easily: they are classifiable apparently neither as individuals taken singly nor as an individual agglomeration taken collectively. So here we have a situation that is parallel to the one we had before: just as, when trying to distinguish clearly between living and non-living we faced problems because of indeterminates like viruses, so also here. We are trying to distinguish clearly between individual and non-individual, but we face the problem of entities like biofilms. These are aggregates of microorganisms, mainly bacteria, in which the constituent living cells adhere to one another on a surface. Biofilms occur in many places, for instance in our showers and even around our teeth. The bacteria in the biofilm have notably different properties from free-floating bacteria of the same kind. The state we call a biofilm allows them to cooperate and interact between themselves, to enjoy a new level of organization between them. What we are referring to by the term 'biofilm', however, has no boundaries as such. So, although the biofilm's own level of internal organization seems to indicate that it is indeed an individual (a kind of superorganism with respect to the bacteria that make it up), its lack of clear boundaries seems to

indicate the contrary. What we see here therefore is something like a collection of units in the process of becoming an individual. The aggregate of separate bacteria, an aggregate which, as such, cannot count as a biological individual is in the process of becoming well organized and thereby an individual, but not there yet.

For most current biologists and philosophers of biology, these are indeed lingering problems that deserve attention, but they do not constitute an overall challenge to the fundamental idea that natural science has exposed the ultimate features of life, that science has practically arrived at its definition. The definition of life is not yet available in its complete form, but current trends assume that what we already know will soon be clarified, tidied up, and settled. We have now a kind of formula for life. Just as chemists were able to supply the correct formula for water, so also biologists have been able to supply the correct formula for life. And once we have the formula for life, the everyday notion becomes redundant.

4. WEAKNESSES OF THE ARGUMENT

The crucial deep issue in this debate is not scientific but philosophical. As I mentioned before, the real question is more general; it concerns the conceptual tension that sometimes arises between what everyday language and experience suggest and what science discovers. The Kripke-Putnam argument seems to justify the idea that the real nature of water is H_2O , and, likewise, it seems to justify the idea that the real nature of life is the definite microstructural explanation biologists will eventually come up with. So what we need to do is to examine carefully all the logical steps that constitute this argument. Is the substitution of an everyday concept by its scientific definition really justified? And if so, on what grounds?

We know that water does not have one property only, the property of being composed of H_2O molecules. It has other properties as well. It is certainly correct to say that it is colourless, odourless, tasteless, good for drinking, and so on. The main point of the Kripke-Putnam argument is that all these other properties are not essential. The microstructure should take precedence. Kripke and Putnam argue for this precedence by appealing to intuition. They say: suppose that on another planet we discover a liquid that has all the macro-properties of water, the properties we are familiar with via direct experience, except its microstructure. We are supposing therefore that its molecular structure is not H_2O but XYZ. Intuition tells us that in such a case we should not call that substance water (Putnam 1990, p. 311). The entire argument regarding water hangs on this one intuition. And the same intuition delivers the same result as regards life. Suppose scientists arrive at the molecular definition of life. Once that definition is available, we will be obliged to say that the essential characteristic of life is such a molecular definition. The properties of life we are familiar with in everyday life would have to give way.

The argument has a serious weak point¹. The intuition it depends on is not as strong as Kripke and Putnam seem to believe. Consider some real-life situations where the microstructure explanation of something competes with the everyday understanding of the same thing. Perhaps the best example is the case of heavy water (Laporte 2004, pp. 104-8). In the 1930s, it was discovered that a new variety of hydrogen exists. This new variety of hydrogen is similar to normal hydrogen except for being heavier: its atoms have a nucleus containing not only one proton but a neutron as well. When this heavy hydrogen combines with oxygen we end up with a variant to normal water. At the time of discovery of this interesting detail about water, how did scientific and linguistic practice concerning the reference of the term «water» actually go? Did it follow the procedure outlined by Kripke and Putnam? Did it favour the microstructure? In fact it did not. The presence of heavy water in all samples of normal water pushed linguistic use towards leaving both normal hydrogen oxide and heavy hydrogen oxide as correct referents of the term «water». This shows that we do not always resort automatically and exclusively to microstructure. There are other factors that count. When we need to decide what the real nature of a thing is, there is no easy answer. It is not always evident which linguistic subgroup has the authority, the final say, to fix the reference of crucial central concepts. Another example is the term 'species' which is very important in various scientific disciplines. In spite of its importance, there is no clarity as to whether the last word on what it means should be given to geneticists, or to systematists, or to ecologists, or to palaeontologists (Richards 2010, chapter 7).

Now if the Kripke-Putnam argument is not clearly convincing as regards water, whose scientific definition is very simple, how much less clearly convincing is the same argument as regards life, whose scientific definition is very complex. In other words, as regards life, even if we were to arrive at its correct scientific definition, its microstructural characteristics, the argument would have no force to oblige us to consider this definition as the one and only notion of life. We would not be obliged to consider it the one account of life that trumps all others. The concept of life remains much richer than whatever science can hope to deliver.

One may want to object here that, in spite of these considerations, Locke's argument regarding the important distinction between real and notional essence still holds. As we saw, Locke's main insight was that the real essence, as he understood it, has priority over the notional essence because the former explains the latter, and not the other way round. As regards life, therefore, we should say that the account of life in terms of its microstructural characteristics, when it arrives, should be given priority because it would be capable of explaining the various other accounts we have. But such an objection is not as powerful as it looks. In fact, some further scrutiny reveals that it is inherently paradoxical. To have access to the real essence of a thing, we are required to go beyond all the

¹ For other weaknesses, and for a broader discussion, see Hacking 1991; Bird and Tobin 2010.

features that constitute our idea of that thing, thereby allegedly arriving at a core that lies behind all these features and explains them all. This operation, however, is impossible because the very idea of having access to a real essence implies that we can conceive of something that lies beyond our conceiving. The problem can be stated in another way. Whatever we take to be the real essence will itself have a nominal essence and presumably an underlying real essence. For instance, if we say that the real essence of water is H_2O , the inquiry about the real nature of water should not stop there. We should continue the inquiry and ask further questions about the nature of hydrogen atoms, about the nature of oxygen atoms, and about the way they combine. And in fact this is exactly what we do. The question of the real essence of water is therefore just shifted to the next lower explanatory level, to the «more micro» level. The entire operation inspired by Locke's distinction therefore leads apparently to an infinite regress: we are meant to excavate the thing's microstructure and then the microstructure of the microstructure, and then the microstructure of that microstructure, and so on. The upshot here therefore is that in our investigation another philosophical method needs to be adopted.

Let me make it clear here that the overall point I am defending is not that a microstructure-definition has nothing to add to the way we normally understand water, or life, or any other thing indicated by a natural-kind term. My point is that a microstructure-definition is not exhaustive. Moreover, I want to propose that, when more than one account of a thing is available, it is not only the case that no one account should be considered exhaustive, but also that the decision as to which account should be given priority depends on the context. As regards life, for instance, within the context of laboratory work, the scientific, microstructural definition of life would be very important. In everyday circumstances, however, other dimensions of the meaning of life should be given priority. The way we use language is an indication of the way we understand. And the way we use language in the context of the natural sciences is different from the way we use language in ordinary life. Language in the sciences is, to a very large extent, representational. It is structured in view of arriving at the correct picture of the world. In everyday life, however, language is not restricted in this way. The normal use of language can be, and often is, multiform and complex. It can involve representation, expression, the managing of interpersonal relations, and other more nuanced functions that supervene on these modes, such as metaphor, irony, and sarcasm. We can do many things with language apart from representing.

Consider now the specific case of the kind of language that is associated with the concept of life. We are not dealing here with the restricted idea of the nature of life but rather with the much broader idea of the meaning of life. This expression «the meaning of life» is used when we want to refer to the various ways of understanding ourselves or others as entities that are extended in time and that enjoy nevertheless an element of unity in the sense that the various events in which we are involved can be considered elements of a consistent and directional narrative. Here we are dealing with the various possible ways of articulating personal identity.

My life has meaning in so far as I can articulate one or more of the following: (1) how my life constitutes the achievement of a major project; or (2) how my life fits in well, coheres well, within an overall project that involves many other people (such as seeing my life as a contribution within the project of a group, a political party, a church, or in the overall unfolding of God's plan for creation); or (3) how what happened and what will happen in my life constitutes a narrative that is, in some sense, positive—it is good, praiseworthy, appreciable by at least some one person or group; or (4) how my life can be seen from above, as it were, in its totality, and how, in this way, it can be compared favourably with the life of those people I deeply admire. We notice immediately that these dimensions are very far from anything that natural science can deliver, because they are dimensions that have to do with interpretation of interpersonal relations, and, as such, depend on the background cultural context. For instance, a theistic background predisposes the person to answer the personal question «What is the meaning of my life?» by interpreting his or her life in relation to God, while an existential background predisposes the person to interpret life-events in terms of personal affirmation against all odds. Such variety arising from context-dependence may, of course, be taken to undermine the value of this overall approach regarding the meaning of life. It may suggest that we are dealing with a hopelessly subjectivist approach which is vastly inferior to the objective answer that can be derived via empirical inquiry and formulated in terms of microstructural features. These doubts, however, regarding the value of this hermeneutical approach are superficial. They are based on a false sense of security that arises by eliminating the first-person perspective at all costs. As regards the complex notion of life, eliminating the first-person perspective does not result in the essence of life but rather in a severe distortion of the original notion. If we want to accept the complexity of this notion, which I think is essential, we need to respect the fact that it does not deal with the microstructural explanation of things. Like many other concepts, it deals rather with the way we engage in communal life within the context of interpersonal relations, with various degrees of success and fruitfulness. Scientists themselves of course, being human, cannot deny this, because, once they look away from their task, once they step out of the laboratory, as it were, they live with others, they engage in interpersonal relations, and they seek the meaning of their life-story.

CONCLUSION

The work of Kripke and Putnam that we considered seemed to offer a definite proof that the meaning of natural-kind terms is necessarily equivalent to the microstructure of what we are referring to. Following their reasoning, we should say that, just as water is necessarily H₂O, so also life is necessarily what scientists will define it to be in microstructural terms. We are not yet in a position to define life completely in this way but the biochemical inquiry about the mechanism of life has made impressive progress within these last decades. If we arrive indeed

at the final scientific definition of life, should this account replace the meaning of life? I argued for a negative reply to this question, especially because the foundational intuition used by Kripke and Putnam is not as secure as they think. The meaning of life remains intact in its form and in its importance. It floats freely, as it were, with respect to scientific inquiry. It remains intact whatever science may deliver as regards the biochemistry of life. The meaning of life cannot be eliminated by digging deeper and deeper into the biochemical fabric of organisms for it is grounded on the interpersonal relations that make human communal living, including scientific cooperation, possible in the first place².

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² The original version of this paper was delivered at a conference entitled «¿Puede la Ciencia definir la Vida?» organized by the Madrid: Catedra de Ciencia, Tecnología y Religión, Universidad Comillas, (12-13 June, 2012). My thanks for the organizers and all those present who offered comments and questions.