

Science and Daily Life: The Ontology of Scientific Explanations

HUMBERTO R. MATURANA

University of Chile - Santiago, Chile

Introduction

Although according to its etymology the word science means the same as the word knowledge, it has been used in the history of Western thinking to refer to any knowledge whose validity can be defended on methodological grounds, regardless of the phenomenal domain in which it is claimed. In modern times, however, this has progressively changed, and the word science is now most frequently used to refer only to a knowledge validated through a particular method, namely, the scientific method. This progressive emphasis on the scientific method has arisen under two general implicit or explicit assumptions of scientists and philosophers of science alike, namely: a) that the scientific method, either through verification, through corroboration, or through the denial of falsification, reveals, or at least connotes, an objective reality that exists independently of what the observers do or desire, even if it cannot be fully known; and b) that the validity of scientific explanations and statements rests on their connection with such objective reality. It is of this kind of knowledge that I shall speak in this article when speaking of science, and in the process I shall implicitly or explicitly disagree, without giving a full philosophical justification, with one aspect or another of what many classic thinkers of the philosophy of science who discuss these matters in depth have said.¹ And I shall do so because I shall speak as a biologist, not as a philosopher, reflecting about science as a cognitive domain generated as a human biological activity. Furthermore, I shall do these reflections attending to what I see that we modern natural scientists do in the praxis of science in order to claim the scientific validity of our statements and explanations, and I shall show how that which we do as scientists relates to what we do as we live our daily lives revealing the epistemological and ontological status of that which we call science.

The Observer and Observing

We scientists do science as observers explaining what they observe. As observers we are human beings. We human beings already find ourselves in the situation of observers observing when we begin to observe our observing in our attempt to describe and explain what we do. That is, we find ourselves already in language making distinctions in language when we begin to reflect in language upon what we do and how we do what we do as we operate as languaging animals. In other words, it happens to us that we are already languaging living systems doing what we do, including our explaining, when we begin to explain what we do, and that we are already in the experience of observing when we begin to observe our observing. Observing is that which we observers do as we distinguish in language the different kinds of entities that we bring forth as objects of our descriptions, explanations and reflections in the course of our participation in the different conversations in which we are involved along our daily lives, regardless of the

operational domain in which these take place. The observer happens in observing, and, when the human being that the observer is dies, the observer and observing come to an end. In these circumstances, when reflecting upon what the observer does, the cognitive abilities of the observer must either be taken as given, unexplainable properties, or they must be explained by showing how they arise as a result of the biology of the observer as a human being. I have done the latter in several articles that I invite the reader to read.² Now, however, I shall proceed on the assumption that the reader accepts that his or her properties and abilities as an observer result from his or her operation as a living system, even though the experience of being an observer just happens to him or her as a matter of course while he or she remains experientially blind to its origin.

Cognition

Living systems are structure-determined systems. As such they do not admit instructive interactions, and everything that happens in them happens as a structural change determined at any instant in their structure either in the course of their own internal dynamics or triggered but not specified by the circumstances of their interactions. In other words, nothing external to a living system can specify in him or her what happens in him or her, and, since the observer is a living system, nothing external to the observer can specify in him or her what happens in him or her. It follows, then, that the observer as a living system constitutively cannot make explanations or statements that reveal or connote anything independent from the operations through which he or she generates his or her explanations and statements. Therefore, that which we observers connote or imply with the word cognition, as we use it in daily life in our interpersonal coordinations of actions and relations when we answer questions in the domain of knowing, must reveal what we do or how we operate in those coordinations of actions and relations as we generate our cognitive statements. That in daily life we act under the implicit understanding that cognition has to do with our interpersonal relations and coordinations of actions, is apparent in that we claim cognition in others and in ourselves only when we accept the actions of others or our own actions as adequate because they satisfy the particular criterion of acceptability that we accept for what constitutes an adequate action in the domain of actions entailed in the question. Accordingly, that which we as observers connote when we speak of knowledge in any particular domain is constitutively what we consider as adequate actions (distinctions, operations, behaviors, thoughts, or reflections) in that domain, assessed according to our own criterion of acceptability for what constitutes an adequate action in it. In other words, knowledge is constituted by an observer as an operational capacity that he or she attributes to another living system, which could be him or herself, by accepting his or her actions as adequate in some operational domain specified in that attribution. Therefore, there are as many cognitive domains as there are domains of adequate actions (distinctions, operations, behaviors, thoughts, or reflections) that the observers accept, and each of them is operationally constituted and operationally defined in the experiential domain of the observer by the criterion that he or she uses for accepting as adequate actions (distinctions, operations,

behaviors, thoughts, or reflections) the actions that he or she accepts as proper to it.³ I call the criterion that an observer uses to accept certain actions as the actions that define and constitute a cognitive domain the criterion of acceptability that defines and constitutes that cognitive domain. Science as a cognitive domain is not an exception to this manner of constitution, and I call the criterion of acceptability that defines and constitutes science as a cognitive domain, and that simultaneously constitutes as a scientist the person who applies it, the criterion of validation of scientific explanations. It is this criterion of acceptability that constitutes science as a cognitive domain that I shall be discussing below when I speak of science.

Acts

We usually speak of acts as external operations of our bodies in some environment. In this article I am speaking of acts in a more general and fundamental manner that includes our external bodily operation as a particular case. I am calling acts all that we do in any operational domain that we bring forth in our discourse, however abstract it may seem. Thus, to think is to act in a domain of thinking, to walk is to act in a domain of walking, to reflect is to act in a domain of reflecting, to talk is to act in a domain of talking, to strike is to act in a domain of striking, and so forth, and to explain scientifically is to act in the domain of scientific explaining. All acts as operations of a living system take place as part of its dynamics of states regardless of whether it has a nervous system or not, but include the dynamics of the nervous system if there is one. Therefore, as operations in the dynamics of states of a living system, all acts are phenomena of the same kind, regardless of the domain in which an observer claims that they take place when he or she considers them while beholding the living system in relation to an environment. Furthermore, all the acts of a living system that involve in it the operation of a nervous system take place in it as dynamic configurations of changes of relations of activity in its nervous system as a closed network of changing relations of activity between its neuronal components.⁴ Thus, to think, to walk, to talk, to have a spiritual experience, and so forth, are all phenomena of the same kind as operations of the internal dynamics of the organism (nervous system included), but are all phenomena of different kinds in the relational domain of the organism in which they are brought forth by the distinctions of the observer.

Emotions

In daily life we distinguish different emotions in ourselves, in other human beings, and in other animals by observing the different domains of actions in which we and they operate at any instant. Thus we may say, »Do not speak with so-and-so now because he is angry, and he will not listen to you or do what you ask«. Emotions are dynamic body dispositions that specify the domains of actions in which animals in general, and we human beings in particular, operate at any instant. Accordingly, all animal acts arise and are realized in some emotional domain, and it is the emotion that defines the domain

in which an act (a movement or an inner body posture) takes place, regardless of whether, for an observer who beholds the animal in an environment, it occurs as an abstract or as a concrete act or of what specifies that act (movement, or inner body posture) as an action of a particular kind. In fact, we know from our daily human life that as we move from one emotion to another we change our domain of actions, and that when we see someone change his or her domain of actions, what we see is a change of emotion. In other words, it is the emotion under which we act at any moment in any operational domain that defines what we do at that moment as an action of a particular kind in that operational domain. Therefore, if we wish to understand any human activity, we must attend to the emotion that defines the domain of actions in which that activity takes place as an action and, in the process, learn to see the actions desired in that emotion.

Language

If we see two persons at a distance too great to hear them and we want to be able to claim later whether they had been talking to each other or not we observe the course of their interactions looking in these for consensual coordinations of consensual coordinations of actions in forms that we may be able to recognize easily, like requests and promises, directions for actions in answer to questions, or complaints. In other words, when we attempt to determine whether two or more persons are interacting in language or not we do not only look for their consensual coordinations of actions, but we look for a dynamics of recursion in their consensual coordinations of actions. That is, we look for the occurrence of consensual coordinations of consensual coordinations of actions as operations in a learned and not in an instinctive domain of coordinations of actions. I maintain that this, our manner of knowing in daily life whether two or more persons interact in language or not, reveals what we do when we are languaging, whichever our domain of operations. In other words, I claim that language takes place when two or more persons in recurrent interactions operate through their interactions in a network of criss-crossing, recursive, consensual coordinations of consensual coordinations of actions, and that all that we human beings do, we do in our operation in such a network as different manners of operating in it. In other words, I claim that we human beings exist as such in language, and that all that we do as human beings we do as different manners of operating in language. Moreover, I also claim that that is what language is as a biological phenomenon in its phylogenetic origin and in its ontogenic constitution: an operation in a domain of consensual coordinations of consensual coordinations of actions that arose as a result of intimate coexistence in coordinations of actions in the lineage of bipedal primates to which we belong and which has to be established anew in each child during its coontogeny with the adults with whom he or she grows.⁵ That is, I maintain: a) that languaging is not a system of operation with abstract symbols in communication; b) that symbols do not preexist language but arise after it and in it as distinctions made by an observer of consensual relations of coordinations of actions in language; c) that although language takes place through the body interactions and the

body changes involved in the consensual coordinations of consensual coordinations of actions of those in languaging, it does not take place in the body of the participants because it takes place in the flow of their consensual coordinations of consensual coordinations of actions; d) that although languaging does not take place in the bodies of those in language, the course of the body changes of those that interact in language braids with the course of their coordinations of actions, and the course of their coordinations of actions braids with the course of their body changes as these arise in the flow of their languaging;⁶ and e) that that which an observer sees as the contents of a process of languaging is a distinction in language that an observer makes of the relations of a process of languaging in a network of languaging. The result of this condition of constitution of language is that we human beings exist as observers in language, and whatever we distinguish in language is operations in language according to circumstances that have arisen in us in language.

Conversations

As mammals we are animals that learn to coordinate the flow of our emotions and behaviors consensually as we live together. As languaging animals we learn to live in consensual coordinations of consensual coordinations of actions also through living together. As human beings we grow and live in consensual coordinations of emotions and consensual coordinations of consensual coordinations of actions that braid with each other and form closed networks of consensual coordinations of emotions and language. In these closed networks of consensual coordinations of emotions and language our actions, and the flow of our actions in language, change as our emotions change, and our emotions and the flow of our emotioning change as our coordinations of actions in language change. I call conversation our operation in this braided flow of consensual coordinations of languaging and emotioning, and I call conversations the different networks of braided, consensual coordinations of languaging and emotioning that we generate as we live together as human beings.⁷ As languaging animals we exist in language, but as human beings we exist (we bring ourselves forth in our distinctions) in the flow of our conversations, and all our activities as such take place as different kinds of conversations. Accordingly, our different domains of actions (cognitive domains) as human beings (cultures, institutions, societies, clubs, games, etc.) are constituted as different networks of conversations, each defined by a particular explicit or implicit criterion of validation that defines and constitutes what pertains to it. Science as a cognitive domain is a domain of actions, and as such it is a network of conversations that entail statements and explanations validated by the criterion of validation of scientific explanations under the passion for explaining.

The Scientist

Science is a human activity. Therefore, whatever we scientists do as we do science has validity and meaning, as any other human activity does, only in the context of human

coexistence in which it arises. All human activities are operations in language, and as such they occur as coordinations of coordinations of consensual actions in conversations that take place in domains of actions specified and defined by some fundamental emotion.⁸ The fundamental emotion that specifies the domain of actions in which science takes place as a human activity is curiosity under the form of the desire or passion for explaining. Furthermore, that which constitutes science as a particular kind of explaining is the criterion of validation that we scientists use, explicitly or implicitly, to accept our explanations as scientific explanations as we practice science under the passion for explaining. I call this criterion of validation of explanations that we scientists use, and which I shall describe further below, the criterion of validation of scientific explanations. It follows from what I have said that we scientists become scientists, while operating under the passion for explaining, when we constitute science as a particular domain of explanations by being rigorous in our endeavor to be always impeccable in the application of the criterion of validation of scientific explanations as we generate explanations that we call scientific explanations. It is this manner of constitution of science and the scientist that gives the use of science its particular operational effectiveness in the worlds in which we modern human beings live.

Scientific Explanations

When in ordinary daily life we answer to ourselves or to somebody else a question that demands from us an explanation of a particular experience (situation or phenomenon), we always answer it by proposing a reformulation of that experience (situation or phenomenon) in terms of other experiences different from those used in the original formulation of the question. If the proposed reformulation is accepted as such by the person asking the question, it becomes ipso facto an explanation, and the question as well as the desire for asking it vanish. As this happens, the accepted explanation becomes an experience that can be used as such for other explanations. In other words, explanations are propositions presented as reformulations of experiences that are accepted as such by a listener in answer to a question that demands an explanation. That is, a proposition presented as a reformulation of an experience that is not accepted as such is not an explanation. Therefore, there are as many different kinds of explanation as there are different criteria that we explicitly or implicitly use for accepting the different kinds of reformulation of experiences that we accept as explanations in answer to our questions. At the same time, the different criteria of acceptability that we use in our listening for explanations define the different explanatory domains with which we operate in our daily lives. It is because explanatory domains are constituted in this manner that that which defines science as a particular explanatory domain is the criterion of validation of explanations that scientists use, and that that which defines a scientist as a particular kind of person under the passion for explaining is the use of the criterion of validation of explanations that constitutes science as an explanatory domain. Finally, as explanations are experiences of the observer that arise as he or she operates in his or her domain of experiences, all explanatory domains constitute expanding experiential

domains in which the observer lives new experiences, asks new questions, and unavoidably generates new explanations in an unending, recursive manner, if he or she has the passion for explaining.

Criterion of Validation of Scientific Explanations

If we attend to what we do as scientists in the praxis of science when we propose a scientific explanation of any particular phenomenon (experience) that we want to explain, we may notice that we accept a given reformulation of the phenomenon to be explained as a scientific explanation only if it is presented as one of four interrelated operations that we must satisfactorily realize in our domain of experiences to validate our explanations as we operate as scientists. I call these four operations, which must be conjointly satisfied in order that a particular reformulation of experiences included among them may be accepted as a scientific explanation, the criterion of validation of scientific explanations; and I call the observer who performs them, and who accepts their conjoint satisfaction as the criterion of validation of his or her explanations, a standard observer or scientist. These four operations are the following:

i) The presentation of the experience (phenomenon) to be explained in terms of what a standard observer must do in his or her domain of experiences (praxis of living) to experience it.

ii) The reformulation of the experience (phenomenon) to be explained in the form of a generative mechanism that, if realized by a standard observer in his or her domain of experiences, would allow him or her, as a result or consequence of its operation, to have in his or her domain of experiences the experience to be explained as presented in point (i).

iii) The deduction from the operation of the generative mechanism proposed in (ii), as well as from all the operational coherences of the domain of experiences of a standard observer entailed by it, of other experiences that a standard observer should have through the application of those operational coherences and of the operations that he or she must realize in his or her domain of experiences to have them.

iv) The experience by a standard observer of the experiences (or phenomena) deduced in (iii) through his or her realization in his or her domain of experiences of the operations also deduced in (iii).

It is only when these four conditions are conjointly satisfied in the praxis of living of a standard observer while he or she is in the process of explaining a particular aspect (phenomenon) of his or her domain of experiences that: a) a standard observer can claim as a scientist that the generative mechanism that he or she proposes in (ii) is a scientific explanation of the experience that he or she presented in (i) as the phenomenon (experience) to be explained; b) that such an explanation is valid while these conditions apply; and c) that such an explanation is valid in the community of scientists as standard observers who accept that the criterion of validation of scientific explanations is satisfied. In other words, there is no single aspect or operation of the criterion of validation of scientific explanations that is by itself scientific, and, therefore, there are no operations

such as scientific observations, deductions, corroborations, or predictions. There are only scientific explanations as propositions of generative mechanisms that are accepted as valid exclusively to the extent that they are part of the satisfaction of the criterion of validation of scientific explanations, and scientific statements as statements that are accepted as valid because they arise directly or indirectly as the result of the application of scientific explanations. Let us consider now some consequences and implications of understanding how we generate science as a cognitive domain through the application of the criterion of validation of scientific explanations for our understanding of what we do when we do science.

1. Explanations in general, as reformulations of experiences accepted as such by an observer, do not replace, and are not expected to replace, the experiences that they explain; they only present the operational conditions of the domain of experiences of the observer under which he or she claims that the explained experience arises. Scientific explanations are not an exception to this, and they also do not replace the experiences that they explain: a scientific explanation only says what happens in a particular part of the domain of experiences of the observer if the operational conditions of the criterion of validation of scientific explanations are satisfied in it.

2. Scientific explanations arise as actual human actions in the domain of experiences of individual standard observers and are valid as such in a community of them, even though each standard observer lives his or her experiences in the total loneliness of his or her structural determinism as a living system.⁹ This situation does not constitute a contradiction because membership in the community of standard observers does not depend on the individual ability of making reference to an independent objective reality that the standard observer as a living system cannot do, but on the consensual participation in the domain of scientific explanations. Accordingly, only those observers who can participate with other observers, and to their complete satisfaction, in the realization of the criterion of validation of scientific explanations and, furthermore, accept this as their only criterion of validation for their explanations, are scientists (standard observers) and members of the community of scientists. Those observers who, for one reason or another, cannot or would not do this are either discarded as standard observers or scientists by the members of the community of scientists under the claim that they are bad observers, or they are not considered at all.

3. As generative mechanisms constituted and accepted in the context of the satisfaction of the four operations of the criterion of validation of scientific explanations, scientific explanations are constitutively mechanistic in the sense that they deal only with structure-determined systems and with the structural determinism entailed in the operational domain in which they are proposed. As such, scientific explanations take place in the domain of experiences of the standard observer, and the domain of structural determinism in which they happen belongs to the area of operational coherences of the praxis of living of the standard observer in which he or she proposes them: a scientific explanation operates only in the area of structural determinism in which it is proposed. Nevertheless, this situation is not a limitation of scientific explanations, on the contrary, it is their condition of possibility.

4. Contrary to a common implicit or explicit belief, scientific explanations, as propositions of generative mechanisms that give rise as a consequence or result of their operation to the experiences (phenomena) to be explained, constitutively do not and cannot operate as phenomenic reductions or give rise to them. This nonreductionist relation between the phenomenon to be explained and the mechanism that generates it is operationally the case because the actual result of a process and the operations in the process that give rise to it in a generative relation intrinsically take place in independent and nonintersecting phenomenal domains. This situation is the reverse of reductionism; scientific explanations as generative propositions constitute or bring forth a generative relation between otherwise independent and nonintersecting phenomenal domains, which they thus de facto validate. The liberation from the belief that scientific explanations are or constitute reductionist propositions that the understanding of the criterion of validation of scientific explanations carries, permits us to see, particularly in the domain of biology, that there are phenomena like language, mind, or consciousness that require an interplay of bodies as a generative structure but do not take place in any of them. In this sense, science and the understanding of science lead us away from transcendental dualism.

5. The fact that in a scientific explanation the phenomenon to be explained should arise in a different phenomenal domain than the one in which the generative mechanism that would give origin to it as a result of its operation takes place, constitutes the phenomenon to be explained as a phenomenon in an abstract relational phenomenal domain with respect to that in which its generative mechanism occurs. There are two basic consequences of this situation: a) there is in principle no restriction about the kind of phenomena that can be explained scientifically, however abstract they may seem, because the phenomenon explained constitutively takes place in an abstract relational domain with respect to the mechanism that gives rise to it; and b) the fact that scientific explanations are mechanistic propositions does not restrict the possibility of using them to explain what seem to be nonmechanistic phenomena such as self-awareness or spiritual experiences.

6. Since the criterion of validation of scientific explanations is defined and constituted only in terms of the operational coherences of the domain of experiences of the standard observers, it does not entail any supposition about an objective independent reality. Accordingly, a standard observer can use scientific explanations only to explain his or her experiences by reformulating them with other experiences, in the application of the operational coherences that these entail through the satisfaction of the criterion of validation of scientific explanations, and not use them to reveal or connote anything deemed to be independent of what he or she does. In fact, the contrary happens, because for these same reasons scientific explanations enter into the constitution of the world or worlds that we standard observers live through the transformation and expansion of our domain of experiences that they bring forth as we operate with the consequences of them in our experiential domain. In these circumstances, the claim that scientists make about the universal validity of scientific explanations and statements does not refer to a pretended revelation through them of an objective, independent, and, hence, universal

reality, but to their validity through the application of the operational coherences that they entail in the world or worlds brought forth through the application of the criterion of validation that constitutes them.

7. Scientific explanations, as reformulations of experiences with other experience in the domain of experiences of the standard observer, pertain to the praxis of living in daily life of the standard observer as a human being. Furthermore, the manner in which we human beings de facto validate our actions in daily life within any operational domain entails the same operational coherences as the criterion of validation of scientific explanations. The difference between our operation in daily life as scientists and as nonscientists rests on our different emotions, on our different desires for consistency and impeccability in our actions, and on our different desires for reflection about what we do. We human beings are multidimensional beings in our desires, in our concerns, and in our enjoyments; and due to this we realize in our daily living many different kinds of beings through different conversations that intersect in our bodies, each grounded on a particular emotion. Thus, as scientists, we are under the passion of explaining, and every doubt, every question, is in us, in principle, an acceptable and desired occasion for our realization as such. Furthermore, we as scientists are also, at least in principle, careful not to confuse experiential or phenomenal domains in our explanatory propositions as we validate them with the criterion of validation of scientific explanations. Finally, we as scientists commit ourselves to use only the criterion of validation of scientific explanations in our explaining. As nonscientists, in daily life we are not careful in this manner, and we use successively many different criteria to validate our explaining and our assertions as we spontaneously change phenomenal domains in our discourse, frequently without being aware that we do so, and we are not interested in applying the conceptual rigor of scientific explanations. Yet, as a result of our structural determinism as living systems, we intrinsically operate in the experience of daily life according to the operational coherences entailed in the criterion of validation of scientific explanations. Or, said in a more fundamental manner, the criterion of validation of scientific explanations is a formalization of the operational validation of the flow of the praxis of living of living systems.

8. Einstein said, and many other scientists have agreed with him, that scientific theories are free creations of the human mind, and he marvelled that through them one could understand the universe. The criterion of validation of scientific explanations as operations in the praxis of living of the observer, however, permits us to see how it is that the first reflection of Einstein is valid, and how it is that there is nothing marvelous in that it is so. Let us reflect upon this. The statement and marvelling of Einstein arise from an implicit supposition that there is an independent reality that the observer finds and explains with explanatory propositions that Einstein sees as arising independently from any direct observation or experimentation with that objective reality. If Einstein's implicit supposition were right, then his marvelling would be right too. The criterion of validation of scientific explanations tells us, however, that to the extent that it does not require any supposition about an objective and independent reality, all that a standard observer does in the generation of a scientific explanation arises in him or her as an

expression of his or her experiential dynamics without any reference to that supposed objective independent reality. Accordingly, points (i) and (ii) in the criterion of validation of scientific explanations pertain totally to the arbitrariness of the observer's mind in the sense that they arise fully in the spontaneity of the reflections of the standard observer as these arise in the flow of his or her structural determinism. The observer does not find a problem or phenomenon to be explained outside him or herself, but on the contrary, he or she constitutes one in his or her domain of experiences as he or she finds him or herself in a question that he or she desires to answer. Furthermore, the observer brings forth the generative mechanism that he or she proposes in the attempt to explain the phenomenon that he or she wants to explain as an ad hoc proposition specifically designed with elements of his or her experience to generate it as a result of its operation, and with no other necessary justification than that. Strictly speaking, here is where the poetry of doing science resides. The other two points, (iii) and (iv), of the criterion of validation of scientific explanations entail operations of a different kind. They arise as deductions, from the operational coherences entailed by point (ii) in the domain of experiences of the observer, of other experiences that he or she has lived, lives, or could live in the form of actual operations in that domain. As such, points (iii) and (iv) are totally subordinated in their generation to points (i) and (ii) that specify when and how they would take place. Finally, since to understand a given experience is to operate in awareness of the circumstances that generate it, and since everything in a scientific explanation occurs in the domain of experiences of the standard observer as his or her actual operation in it, scientific theories cannot but arise as free creations of our operation as standard observers, and cannot but take the form of reformulations of our experiences with elements of our experiences that constitute de facto our understanding of our domain of experiences as we live it through our scientific explanations of it.

9. Under the implicit or explicit assumption that science has to do with the revelation of the properties of an objective (ontologically independent) reality, it is frequently believed, even by scientists, that for any theory or explanation to be scientific, it must entail quantifications and predictions. Thus, one frequently hears, at least colloquially, a rather satirical distinction between hard and soft sciences according to whether they are quantitative or not, implying that the soft ones are not really sciences, or that one cannot develop a scientific theory in any particular domain if one does not or cannot make measurements and propose predictions in it with a validity that can be asserted with objective quantitative observations. These beliefs are both misleading and inadequate because they obscure our direct view of the operations through which the standard observers constitute science as a cognitive domain. What makes a scientific explanation or theory scientific is not quantification or the possibility that it creates for an observer to predict some of his or her future experiences with it, but that it is validated as it arises through the application of the criterion of validation of scientific explanations without reference to quantification or any restriction of domain. A standard observer can generate a scientific explanation or theory in any domain in which he or she can apply the criterion of validation of scientific explanations. What happens with quantifications and predictions is something different. To quantify or to measure is to

apply a metric, defined as a system of repeatable comparisons that an observer makes between two areas of his or her domain of experiences, to another area in it. As such, a measurement or quantification does not constitute an independent or objective validation of any statement that the observer makes, but, if it is properly done, it facilitates or makes possible his or her deductions in the area of operational coherences of his or her domain of experiences in which it applies. Similarly, a prediction, as a tentative computation of a change of state in a not fully described structure-determined system brought forth by the observer as an abstraction of his or her operational coherences in his or her domain of experiences, is also an operation that, if successful, cannot by itself constitute an objective validation (a validation independent of what the observer does) of the structure-determined system in which it takes place. Quantifications (or measurements) and predictions can be used in the generation of a scientific explanation but do not constitute the source of its validity.

10. The notions of falsifiability¹⁰, verifiability, or confirmation would apply to the validation of scientific knowledge only if this were a cognitive domain that revealed, directly or indirectly, by denotation or connotation, a transcendent reality independent of what the observer does, and if point (ii) in the criterion of validation of scientific explanations were a model of that transcendent reality rather than a generative mechanism that gives rise to the experience to be explained as it is presented in point (i). However, since according to the criterion of validation of scientific explanations, scientific explanations and scientific statements do not refer to an independent reality and do not pretend to do so, such notions do not apply in the domain of science, even though they may have a metaphorical use. No doubt, points (iii) and (iv) of the criterion of validation of scientific explanations offer to an observer the operational possibility of believing that he or she realizes the falsification, verification, or confirmation of what is proposed in (ii), if he or she believes that in this proposition he or she has a model of how the objective reality, which he or she intends to know while assuming that it exists independently of his or her doings, is. Yet, such a belief, as it is apparent from all that I have said, is a source of blindness for our understanding of what we do as we do science, leading us not to see that the validity of what we do in science rests exclusively in the operational consensuality in which it arises as a manner of human coexistence under conditions in which the notions of falsification, verification, or confirmation do not and cannot apply. Since the implicit belief in an objective, independent reality as a source of universal validity of knowledge is a basic part of our Western culture in which science arose and we usually believe also that the strength of science rests on it, let me again repeat some of the arguments that indicate that science and its operational validity and effectiveness do not depend on it. a) Scientific explanations arise operationally as generative mechanisms accepted by us as scientists through operations that do not entail or imply any supposition about an independent reality, so that in fact there is no confrontation with one, nor is it necessary to have one, even if we believe that we can have one. b) If we listen to what I said above in points (iii) and (iv) of the criterion of validation of scientific explanations, we cannot but notice that these points do not entail any supposition about an independent reality, and that they refer only to the operational

coherences of the domain of experiences of the standard observer, regardless of what he or she may think about what reality is. c) The standard observer as a living system is a structure-determined system, and as such he or she cannot operationally make a distinction that can in any way be claimed to be a distinction of something independent of his or her doing, and, due to this, he or she cannot have any operational conception of anything that does not pertain to his or her domain of experiences.¹¹ d) No matter what we may say, we scientists proceed in our research under the inner body disposition (emotion) of following the path of validation of our explanatory propositions, not of finding the conditions of their falsification.

Science as a Cognitive Domain

The use of the criterion of validation of scientific explanations defines and constitutes scientific explanations. The use of scientific explanations to validate a statement makes that statement a scientific statement. The use of scientific explanations by the members of a community of standard observers to directly or indirectly validate all their statements defines and constitutes science as a cognitive domain that defines as a scientific community the community of those observers that use it. Therefore, ontologically, in its manner of constitution as a cognitive domain, science is no different from other cognitive domains because it is defined and constituted as all cognitive domains are, namely, as a domain of actions defined by a criterion of validation or acceptability used by an observer or by the members of a community of observers to accept those actions as valid in a domain of actions defined by that very same criterion of acceptability.¹² Let us now see some implications that this manner of constitution has for our understanding and use of science as a cognitive domain.

1. It is frequently claimed that scientific knowledge has to be accepted as universally valid because the explanations and statements that belong to it are validated through their continuous confrontation with an independent objective reality. The manner of constitution of science as a cognitive domain, however, indicates that such a notion cannot be sustained, and that scientific explanations and statements are universally valid only in the community of those observers who accept the criterion of validation of scientific explanations as the criterion of validation of their explanations. In this respect, science is no different from any other cognitive domain, since all cognitive domains are by constitution valid only in the particular community of those observers who accept the criterion of validation of adequate actions that defines such a community. It is also often claimed that it is the universality and objectivity of scientific knowledge that gives scientific rational arguments their compelling power and scientific statements their convincing character. In this respect, however, science is no different from other cognitive domains either, because all properly rational arguments (arguments without misapplied operational coherences) are by constitution valid only in the cognitive domain in which they belong. Finally, science as a domain of adequate actions in the domain of experiences of an observer is also no different from any other cognitive domain that an

observer may claim, because all cognitive domains are domains of adequate actions of an observer in his or her domain of experiences.

2. The peculiarities of science as a cognitive domain arise from its manner of constitution through the application of the criterion of validation of scientific explanations. Let us see some of them. a) The criterion of validation of scientific explanations describes what we modern natural scientists explicitly or implicitly do in the praxis of scientific research or what we expect should have been done by someone who claims that he or she is proposing a scientific explanation or making a scientific statement. b) Since the criterion of validation of scientific explanations consists by constitution in the rigorous application (without confusion of domains) by a standard observer of the operational daily validation of his or her praxis of living, all scientific explanations and statements pertain to the praxis of living of the standard observer, and the standard observer cannot generate through science statements or explanations that are not de facto constituted in the operational coherences of his or her praxis of living. c) Since the criterion of validation of scientific explanations allows a standard observer to validate generative relations in nonintersecting phenomenal domains, science is by constitution a multidimensional cognitive domain, and a standard observer can expand, through the generation of scientific explanations and scientific statements, all the dimensions of human experience in many nonintersecting phenomenal domains. Finally, d) since the criterion of validation of scientific explanations entails the operability of reflection, science as a cognitive domain is by constitution a domain in which a standard observer can recursively treat any experience in it as an object of reflection in it without falling out of the operational coherences of his or her praxis of living.

3. We scientists claim that our emotions do not participate in the generation of our scientific statements and explanations. We claim this because the criterion of validation of scientific explanations fully specifies in a manner that is constitutively independent of our emotioning the operations that we have to perform as standard observers to generate a scientific explanation. In addition, as we learn to be scientists, we learn to be careful in not letting our preferences and desires to distort, and thus to invalidate, our application of the criterion of validation of scientific explanations, and we also learn to recognize that when we allow this to happen we commit a serious blunder. Our emotions, however, enter legitimately and constitutively into what we scientists do in the foundation of the circumstances of our scientific explaining, because they specify at every moment the domain of actions in which we operate as we generate our questions. We human beings bring forth with our actions in our domain of experiences the worlds that we live as we live them in our domain of experiences as human beings, and we move in the worlds that we bring forth changing our concerns and our questions in the flow of our emotioning. In other words, the poetry of science is grounded on our desires and concerns, and the course followed by science in the worlds that we live is guided by our emotions, not by our reason, as our desires and concerns constitute the questions that we ask as we do science. It is the conversations in which we are immersed as we do science that determine the course of science. And this cannot be otherwise because whatever we human beings do arises in our operation as such in our domain of experi-

ences through the continuous braiding of our languaging and our emotioning that is all that we human beings do.¹³ Therefore, we do not find problems or questions to be studied and explained scientifically outside ourselves in an independent world. We constitute our problems and questions as we flow in our praxis of living, and we ask the questions that we in our emotioning desire to ask. Our emotions do not enter in the validation of our scientific explanations, but what we explain arises through our emotioning as a concern that we do not want to ignore, and we explain what we wish to explain, and we explain it scientifically, because we like to explain in that way. So, science as a cognitive domain exists and grows as such always expressing the concerns, desires, ambitions, aspirations, and fantasies of the scientists, regardless of their claims to objectivity and emotional independency.

4. The fact that science as a cognitive domain is constituted and validated in the operational coherences of the praxis of living of the standard observers as they operate in their experiential domains without reference to an independent reality, does not make scientific statements subjective. The dichotomy of objective - subjective pertains to a cognitive domain in which the objective is an explanatory proposition that asserts, directly or indirectly, the operational possibility of pointing to an independent reality. Science does not, and cannot, do that. The fact that the criterion of validation of scientific explanations constitutes science as an explanatory domain that arises in the recursive operation of the standard observer within the operational coherences of his or her domain of experiences, makes the scientific reference to anything conceived as an objective, independent reality operationally impossible. Science as a cognitive domain is realized in the operational coherences of the domain of experiences of the standard observer in his or her praxis of living as a human being, and as such the observer lives it as a domain of constitution of experiences in his or her domain of existence.¹⁴

5. The notions of objectivity and universality in science can be used in different and at the same time more relevant manners for the praxis of science than those to which I have objected above. Thus, we can listen to the claim of objectivity in the praxis of science as the commitment of the standard observer not to let his or her desires or preferences distort or interfere with his or her application of the criterion of validation of scientific explanations. Similarly, we can listen to the claim of the universality of science as claiming that because science as a cognitive domain takes place in the praxis of living of the standard observer as a human being, every human being can, in principle, operate as a standard observer if he or she wishes to do so. Therefore, the claims of objectivity and universality in science are moral, not ontological claims. The legitimacy of these claims in the manner just mentioned above, even if we do not usually understand them like this, is one of the conditions that gives to scientists both the possibility of escaping the always present temptation of fanaticism and the possibility of keeping science as a cognitive domain always open to the understanding and practice of every human being.

6. Since the criterion of validation of scientific explanations can be made fully explicit operationally and does not entail any direct or indirect reference to an independent reality or objective world, it can be learned, used, and applied with total

independency of the beliefs of the standard observer about reality, values, and spiritual life. This is why we scientists are not always wise. The path of modern science is not the path of wisdom in living the worlds we human beings live, even though it does not necessarily contradict it. The path of wisdom, as the path of understanding, care, and responsibility for the consequences of our actions in the worlds that we human beings bring about and live, must be specially cultivated if it is to have any presence at all in our daily lives. Spiritual experience is an experience of belonging in a community or cosmic realm that happens to us human beings in one way or another along the paths of our lives, and it has frequently been of basic significance for the harmony and health of our human social life. As such, spiritual experiences cannot be denied, and science does not deny them. Indeed, experiences are never a problem in the domain of human coexistence, it is in the domain of explanations and of use of our experiences where we may enter into deadly disputes. It is the fanaticism that may arise around the explanation of experience when someone claims to have access to some transcendent truth that constitutes a source of strife and suffering in human coexistence. To the extent that science does not stand on any system of beliefs because it belongs exclusively to the domain of the operational coherences of the praxis of living of the standard observers as a human beings, science constitutes for us the operational possibility of being responsible for our actions by giving us the possibility of becoming aware of our emotions and of knowingly acting according to our desires.

7. Notions of progress, of social responsibility, and of ethics do not apply to science as a cognitive domain. Indeed, science, as any other cognitive domain, is operational in its constitution, and as such it is value-free. Notions of progress, social responsibility, and ethics apply to human actions and, therefore, to what we scientists, artists, technologists, or whatever kind of person we may be, desire and do as human beings. We human beings operate and exist as an intersection of our conditions of observers (in conversations) and living systems, and as such we are multidimensional beings, actual bodynodes of a dynamic intercrossing network of discourses and emotions that continuously move us from one domain of actions to another in a continuous flow of many changing conversations. Accordingly, we scientists practice science as a manner of living under one of the numerous emotions that constitute us in our living as normal emotional human beings, namely, under the passion or desire for explaining. Nevertheless, which area of our domain of experiences we chose at any moment to investigate, to explain, or to analyze as scientists, or to what uses we choose to put the results of our scientific activities, depends on other emotions that show up in us in the course of our lives. Once scientific knowledge is there, we can use it for whatever purpose we may wish as our different desires, passions, fears, or aims arise in us with the flow of our languaging and emotioning. As this happens, we begin to act, let us say, as technologists, entrepreneurs, artists, cheaters, politicians and so forth, as some of our other human concerns show up as we become involved with technical, productive, aesthetical, personally advantageous, or social actions. It is in this context that notions of progress, ethics, and social responsibility acquire their presence. Thus, the notion of progress has to do with what we consider better or desire to be the case in human life;

the notion of social responsibility has to do with our awareness of whether we do or do not want the consequences of our actions; and the notion of ethics has to do with our concern for the consequences of our actions on the life of other human beings that we accept in coexistence with us. Yet, the notions of progress, ethics, and responsibility do not pertain to science as a cognitive domain, but they apply to us scientists as human beings because every thing that we do involves us and the human and nonhuman communities of living beings to which we belong and who support us in our endeavors.

8. I have not spoken of truth or natural law; indeed this is not an accident. We usually use notions of truth and nature to explicitly or implicitly connote a reality independent of what we do as observers, either as a reference through which we may validate our statements or as an argument that gives them universality. From all that I have said, however, it is apparent that science has nothing to do with a notion of truth that is independent of the criterion of validation that constitutes a scientific statement or explanation as valid in the cognitive domain constituted by the criterion of validation of scientific explanations. At the same time, the notion of relative truth does not apply to science either, because such a notion is valid only in reference to an absolute truth. In other words, the dichotomy between absolute and relative truths does not apply in science because all that one may be saying in science when claiming that a statement is scientifically true is that it is a scientific statement. Something similar happens with the notion of nature. Since the observer cannot make any cognitive statement about anything independent of his or her operation as a living system, the notion of nature constitutively can refer only to what the observer does (in language) as a human being explaining his or her experiences as such, and, hence, it cannot refer to anything deemed independent of what the observer does.¹⁵ Nature is an explanatory proposition of our experience with elements of our experience. Indeed, we human beings constitute nature with our explaining, and with our scientific explaining we constitute nature as the domain in which we exist as human beings (or languaging living systems). Scientific explanations and statements are not validated through a reference to nature, but nature is operationally constituted (known) and expanded as we constitute it as our domain of experience as living systems through our scientific explanation of our experience with elements of our experience. To act according to our awareness of our continuous constitution of nature through our explanations of our experience being aware of the constitutive nature of nature, is our greatest responsibility as human beings in general, and as scientists in particular.

9. Science, as a cognitive domain, changes as the questions that the standard observer asks and the explanations that he or she accepts change, and these change as his or her domain of experiences changes in the flow of his or her praxis of living. Since language takes place in the domain of consensual coordinations of consensual coordinations of actions, and these take place through the body encounters of the participants in it, the bodyhood of those in language changes according to the flow of their languaging, and the flow of their languaging changes contingently to the changes of their bodyhood. Due to this recursive braiding of bodyhood changes and consensual coordinations of actions in language, everything that the observer does as a human being

takes place at the level of his or her operational realization in his or her bodyhood in one and the same domain, namely, in the domain of sensorimotor correlations through which we do all that we human beings do. In these circumstances, human activities that are totally different in the conversational domains in which they are distinguished as human activities, such as theoretical and practical actions, do not differ in their actual realization through the bodyhood of the acting human beings.¹⁶ In other words, the result of the braiding of bodyhood and consensual coordinations of actions is that the practical and the theoretical cognitive domains arise as two different but mutually entailing aspects of the consensual coordinations of actions of the observers, and constitutively what arises in the theoretical domain gives rise to adequate actions in the practical domain that it entails, and vice versa. Our only difficulty as observers with the theoretical and the practical is that we are not always aware in what area of our domains of experience the mutually entailing practical and theoretical domains take place in each particular case when we begin to consider some practical or theoretical action. As a result, as observers of our experiences in our reflections in language, we may expect experiences in one area of our experiential domain that pertain to another.

10. Creativity is an assessment made by an observer that claims novelty according to his or her listening in the activities, operations, or distinctions of another observer, that could also be him or herself, when these activities, distinctions, or operations appear to him or her as unexpected. The same applies when we speak of creativity or novelty in any domain of science. Everything happens to us as experiences that just occur to us without effort as a matter of course, and this is why we are blind to their origin and have to invent explanations when we want to account for them. Furthermore, everything happens to us as distinctions in language that we make in the conversations that we live, blind to the dynamics of states of our bodyhood through which they arise. As a result, the more complex and rich our dynamics of state (including the dynamics of states of our nervous system, of course), the more unexpected will be our participation in the different conversations in which we are involved, and the more creative we shall be in the eyes of the surprised beholder. And the more complex and multidimensional our life, the more novel, strange, or unexpected will appear our actions and distinctions in language to those with whom we live without sharing all our conversations. The same happens in the practice of scientific conversations. Novelties, changes, or conceptual revolutions occur in science when a standard observer, as a result of his or her recursive operation in his or her domain of experiences through conversations outside the accepted domain of scientific reflections, and in the context of the continuous structural change that he or she necessarily undergoes in them, brings forth, simply as a matter of course, some unexpected configuration of operational coherences acceptable in the scientific community. Novelties in science, therefore, constitute new dimensions of operational coherences in the domain of experiences of the standard observers, but they do not disclose any hidden independent reality.

11. Due to its manner of constitution, science as a cognitive domain is a domain in which the observer brings forth existence in its own domain of existence as the domain in which he or she distinguishes him or herself as a living system. In this sense science

is a domain of ultimate explanations, not because scientific explanations do not change or are objective or true in a transcendent sense, but because they arise and remain in our domain of constitution as living systems.

Conclusion

Science is the domain of scientific explanations and statements that we scientists generate through the application of the criterion of validation of scientific explanations. As such, we scientists deal in science with the explanation and understanding of our human experience (human life) and not with the explanation and understanding of nature or reality as if these were objective domains of existence independent of what we do. Human experience is content-free. In our experience we do not encounter things, objects, or nature as independent entities as it seems to us in the naivety of daily life; we live in experience, in the praxis of living of human beings in the flow of being living systems in language as something that happens in us and to us as we language it. This is why, as we as scientists explain our experience as human beings by reformulating it with elements of it through the application of the criterion of validation of scientific explanations, we find ourselves generating science as a cognitive domain that does not take us out of experience and keeps us in language. We human beings exist in language, and our experience as human beings takes place in language in a flow of consensual coordinations of consensual coordinations of actions that we bring forth in language. Objects, awareness, self-reflection, self, nature, reality, and so forth, all that we human beings do and are, takes place in language as distinctions or as explanations in language of our being in language. So experience takes place in language, science takes place in language as we use language to generate it, but not as an abstraction or as a mere discourse, but as something as concrete as any operation in the flow of consensual coordinations of actions in which we arise and exist. That we exist in language, and constitutively cannot exist outside of it because we are constituted in it, and that by being in language we only generate experiences in language, is not a limitation in us, but, on the contrary, it is the condition that makes possible science as an explanatory domain such that whatever we bring forth in it becomes part of our existing as human beings. Indeed, that by existing in language our experiential domain should be a closed domain from which we do not and cannot come out, appears as a limitation only if we think that we should be able to refer to an independent reality.

I have said above that a central aspect of doing science has to do with our quest for understanding our experience as human beings. And I mean by understanding the experience of adopting an operability of reflection in language in which we can know what we know in the circumstances of constitution in language. In order to reflect, we need to release that which we constitute in our distinctions as an object of our reflection so that we may contemplate it, but we must do so without fear of losing that which we release, so that we may look at it without obscuring it through our attachment to it. Moreover, we must possess a procedure that, if properly applied, allows us to operate in our reflections as if we were indeed dealing with something that exists independently

from what we do, so that we may realize the operation of contemplation. The criterion of validation of scientific explanations provides us with this procedure in a manner that no other methodological approach could do because it does not require any assumption about the origin of our abilities as observers, so that these can also be the subject of our inquiries with it. In other words, it is the fact that the criterion of validation of scientific explanations takes place as a system of operations of the standard observer in his or her domain of experiences that gives rise in him or her to further operations in it without entailing any supposition about the origin of his or her abilities that permits the standard observer to treat any aspect of his or her domain of experiences, including his or her abilities and capacities as an observer, as an object of his or her scientific inquiry.¹⁷

In a scientific explanation, a standard observer proposes an ad hoc mechanism that would give rise as a consequence of its operation to the experience that he or she wants to explain. In other words, the generative mechanism proposed in a scientific explanation is arbitrary and can be any, providing that it operates as such with respect to the experience to be explained. In these circumstances, all that makes scientific explanations operationally effective in our human praxis of living is that they arise as operations in it that give rise to further operations in it and not an impossible reference to anything like an independent objective domain of reality. At the same time, it is because of this that science is an operational domain in which the standard observer recursively creates knowledge in his or her praxis of living. Indeed, it does not matter how strange or crazy any particular generative mechanism proposed as a reformulation of our experiences may initially seem to us. If such a mechanism becomes validated through the criterion of validation of scientific explanations, it becomes so in our recursive operation in language with the operational coherences of our domain of experiences, and becomes as such for us a source of adequate actions in our praxis of living in the area of our domain of experiences in which it is valid. Our operational creativity through the use of science needs no other explanation, it occurs to us in our doings as standard observers; yet, that this should be so makes us scientists fully accountable for what we bring forth through the practice of science. As we explain our experience scientifically, thus it becomes the world we live. We cannot claim innocence anymore.

In our modern Western culture we speak of science and technology as sources of human well-being. However, usually it is not human well-being that moves us to value science and technology but rather the possibilities of domination, of control over nature, and of unlimited wealth that they seem to offer. We fight a hostile nature, we say, and we look for scientific knowledge as in search of an instrument that would permit us to control and to manipulate it rather than to understand it. We also speak of progress in science and technology in terms of control and domination and not in terms of understanding and responsible coexistence. The notions of control and of domination entail the negation of that which is controlled or dominated as well as positing it as something different and independent from oneself. I think that it is this basic attitude that limits our possibility of grasping without anxiety our constitutive participation in bringing forth the world that we live through science. Whatever we distinguish we

distinguish it in language, whatever we experience we experience it as we distinguish our experience in language. That this should be so, however, is not a problem for us in our living, it just happens in us and to us as we distinguish our experiences. Experience, the happening of living, is not a problem for us, our problems arise with our explanations of our experiences and the demands that they impose upon us and those other human beings with whom we coexist. We human beings live a world of explanations and descriptions in language of our experiences as we bring them forth in language, and we even kill each other defending our explanations when we are in discordance about them. Furthermore, since explanations are reformulations of experiences with elements of experience in the operational coherences of experiences, we live different worlds as we bring forth in our praxis of living different operational coherences as we adopt different systems of explanations in our living. This is not a vacuous statement because language is constituted as a domain of consensual coordinations of actions in the domains of operational coherences of the observers, and if two observers accept different explanations they live different areas of operational coherences in their domains of experiences. Life happens to us, experience happens to us, the worlds we live happen to us as we bring them forth in our explanations. Moreover, since every system or mechanism operates only if the operational coherences that it entails are satisfied, life and experience happen to us as they happen to us only to the extent that the operational coherences that constitute them are satisfied. Finally, as we human beings exist in language, our bodyhood are nodes of operational intersection of all the operational coherences that we bring forth as observers in our explanation of our operation, and we live them through mapping them in our discourse as if they were taking place in a single operational domain. As long as we are not aware of this, we confuse operational domains and expect that a particular system or mechanism should operate in a different domain of operation than the one in which it takes place. Also, if we are not aware of this mapping of our discourse in our discourse, we shall not be able see that the value of science for human life lies in the possibilities that it opens for understanding it by permitting us to enter in recursive reflections on our domain of experiences through the application of the operability of the criterion of validation of scientific explanations as part of our daily operations in our domain of experiences.

We scientists frequently demand a special status for science as a cognitive domain and require a special freedom and respect for our pursuit of scientific research, claiming that scientific knowledge deserves a special respect on account of its objective, factual nature. We scientists are concerned with objective facts, we say, and because of that our statements and explanations are free from fanaticism and prejudices. As we have seen, this is only partly true. The value and operational effectiveness of scientific statements and explanations rests on the fact that they pertain to the operational coherences of our praxis of living as human beings, and for this science does not deserve a special status. Yet, science deserves a special status because the criterion of validation that constitutes it entails the operability of a reflective dynamics which, if properly learned and practiced by the standard observer, allows him or her to remain an observer of all his or her circumstances without attaching to them. The latter, however, does not

always happen. What science and the training to be a scientist does not provide us with is wisdom. Modern science has arisen in a culture that values appropriation and wealth, that treats knowledge as a source of power, that prizes growth and control, that respects hierarchies of domination, that values appearances and success, and that has lost sight of wisdom and does not know how to cultivate it. We scientists in our efforts to do what we like most, namely, scientific inquiry, frequently fall prey to the passions, desires, and aims of our culture and think that the expansion of science justifies everything, becoming blind to wisdom and how it is learned. Wisdom breeds in the respect for the others, in the recognition that power arises through submission and loss of dignity, in the recognition that love is the emotion that constitutes social coexistence, honesty, and trustfulness, and in the recognition that the world that we live is always, and unavoidably so, our doing. But, if science and scientific knowledge do not provide us with wisdom, at least they do not deny it, and the awareness of this opens the possibility of learning it by living in it to those who escape the ambition for success and the desire for control and manipulation.

Overview

By accepting that science as a cognitive domain constituted through the application of the criterion of validation of scientific explanations does not deal with truth or reality in a transcendent sense but only with the explanation of human experience in the domain of human experiences, many questions disappear or fully change their character, and new insights are possible. Let us see some of them.

Truth stops being an argument that can be used without specifying its conditions of constitution and validation, and the observer has the possibility of relinquishing his or her claim to be the owner of it.

Nature stops being an autonomous domain of independent entities that can be used as a confrontational reference for accepting or rejecting any particular explanation as a scientific explanation to become something that arises through the operation of an observer in language in his or her domain of experiences.

Learning to be a scientist becomes, for the observer who desires to do so, a process of learning how to apply the criterion of validation of scientific explanations, of expanding some particular area of his or her domain of experiences, and of reaching a total personal commitment to act with honesty and operational impeccability in the generation of scientific explanations and statements, and, in the long run, in his or her daily life.

Emotions become respectable and apparent, and it becomes possible to see that for an observer to act responsibly is to act with awareness of whether he or she wants or does not want the consequences of his or her actions.

The application of the criterion of validation of scientific explanations as a manner of living enables the observer to operate systematically in a recursive reflection upon his or her circumstances and become responsible with respect to his or her actions, regardless of whether he or she reaches in any particular case to its completion.

The understanding that the criterion of validation of scientific explanations arises as a systematization of one normal operational manner of validation of our operation in daily life in the care of not confusing domains of experience, permits us scientists to become aware that the only thing special in us is our passion for explaining scientifically.

I consider that the greatest spiritual danger that a person faces in his or her life is to believe that he or she is the owner of a truth, or the legitimate defender of some principle, or the possessor of some transcendental knowledge, or the rightful owner of some entity, or the deserving meritor of some distinction, and so forth because he or she immediately becomes blind to his or her circumstance, and enters into the closed alley of fanaticism. I also consider that the second greatest spiritual danger that a person faces in his or her life is to believe in one way or another that he or she is not always totally responsible for his or her acts or for his or her desiring or not desiring the consequences of them. Finally, I consider also that the greatest gift that science offers to us is the possibility to learn, free from any fanaticism, and if we want it, to learn how to remain always responsible for our actions through recursive reflections on our circumstances.

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