

Reflections on Cognition and Reality

Humberto Maturana Romesín

Groundings

Presentation

I come from Chile, where I am an Emeritus Professor in the Faculty of Sciences at the University of Chile. With Professor Ximena Dávila Y., I am a co-founder of the Escuela Matriztica de Santiago, where our main concern is to understand how it is that „we human beings care about what happens to other human beings“, asking whether this is a consequence of our philosophical, religious or political theories, or a result of our biological-cultural human nature. Accordingly, everything that I shall present to you here in this lecture is an expression of our work at the Escuela Matriztica de Santiago and of the expansion of our understanding of the nature of humanness through our reflections on our existence as molecular autopoietic beings since 1999.

My present purpose

In this lecture I wish to show to you that we human beings are at the centre of the cosmos that we live because we generate it as we describe and explain the features and processes of our living with the processes of the realization of our living. Indeed, I wish to invite you „to a new bite of the apple.“

Myself here

I am particularly happy to be here today because Germany has been attractive to me since I was a child, and I wish to begin by telling you a little about my life to show how I found that I was intimately connected with Germany without knowing that I was. More than thirty years ago, I was participating in a meeting in Frankfurt with a dear friend, Professor Heinz von Foerster. You may have heard of him, since earlier this year there was a meeting in his honor in Vienna on the occasion of the hundredth anniversary of his birthday. I had not been in Germany before. We had to separate and would meet again in Cologne, so he took me to a railroad station and put me on a train, choosing a window seat for me. So there I was, looking at a river landscape without knowing the name of the river. I later discovered that it was the Rhine. As I contemplated the river and the landscape along its shores, I was moved by what I saw and began to think of my childhood, asking myself what I had to do with that river and its surroundings that touched me much. As I looked at the houses, the churches, the castles along the shores of the river, I realized that I was contemplating the illustrations in some of the children's books that I had read in Spanish when I was a boy. I realized that I had contemplated that very landscape in the illustrations of those books that I had read in Santiago. I had thought then that the illustrations were a fantasy, but I was seeing now that they were not – they were drawings of the landscape along the Rhine. And I found that, in my soul, I was more related to Germany than I could ever have imagined.

I also want to thank you for being here, and I thank you for your trust, by which I mean your trust in that I am going to say something that will have to do with you. I also thank you for your presence trusting that you are here not as a result of an obligation, but out of curiosity, and your curiosity is a gift for me. And in fact, this is good because I am going to talk about you and, of course, about myself too: I am going to talk about our daily life as human beings. And I shall do so speaking as a biologist aiming at showing you that all that we do, whatever this may be, we do it as human beings in the realization of our living as molecular autopoietic beings. That is, I shall present some biological-philosophical reflections on our human

existence. We do philosophy whenever we reflect on the fundamentals of what we say or do, and usually these reflections start from some basic suppositions or ontological assumption that we accept as being valid, either consciously or unconsciously. However, I will not start my reflections by making any basic supposition; my starting point will be us human beings doing whatever we may be doing in our daily living: our grounding point will be our daily living. And my basic question will be, how is it that we may explain what we do and the cosmos in which we find ourselves living as we reflect about ourselves. Accordingly, in what follows, I propose to explain what we do as human beings with what we do in our doings as human beings.

We observing beings

Everything that we human beings say, we say as persons that are recursively observing what they do in the relational space where they distinguish the world that appears in their doings. As persons we operate as observers, feeling that we exist immersed in a world that we feel and live as if it existed independently of what we do, and we feel that everything that we distinguish as entities, processes or happenings of any kind exists somehow outside of us, universally accessible to anyone who care to look, to touch, to listen, to smell or taste if they follow the adequate procedure: "If you do this ... and this ... you will see or touch or hear ... it." And this is precisely what we are usually referring to when we speak of objectivity and what we are referring to when we say that something is real. We usually think that knowledge refers to what we can say or claim to be real, and which we think exists independent of what we do as we distinguish it.

Moreover, we also expect that everything that we distinguish will operate and satisfy certain relational-operational coherences according to some intrinsic properties if what we distinguish arises as a totality, or according to the manner in which it is made if it arises as a composite entity. And this is so much so that we are surprised and think that we must have made a mistake if it does not happen. We call this feature of the worlds in which we live structural determinism. Furthermore, everything we do in our living we do trusting that the features of structural determinism will be conserved under all circumstances, and that every change that occurs in the world we live occurs as a change of relations between structurally determined entities or processes. I refer to the conservation of structural determinism as fundamental inertia. Everything we call logical is a constructive operation that we perform in the form of a deduction that we make, relying on structural determinism and its fundamental inertia. The effectiveness of science, technology and daily life rests on structural determinism and its fundamental inertia. Moreover, as I said above, we usually think that the effectiveness of what we do and of the explanations that we accept as valid, rests on our knowledge of something that exists independent of what we do as the transcendental fundament of the existence of everything that we may distinguish, and that is in principle accessible to every person, and which we call Reality. According to this, the access to Reality would be the fundament of all valid cognitive statement. Indeed, with the use of this notion that we call Reality we seem to be able to explain how all the happenings in nature happen. And yet there is something that we cannot explain by using the notion of Reality as a referent for a transcendental something that we assume to exist independently of what we do when we make a distinction. And this is the manner of operating of the nervous system in the acts that we usually call perception and cognition as if they were acts of effectively referring to acts that capture something of that assumed independent Reality. If we seriously attempt to explain how the nervous system would capture that independent reality, so that we may indeed speak of it, we realize that it is not possible to do so because the nervous system does not operate in the way that it should for that to happen.

Invitation to reflect

What is to reflect?

Reflection is an act in which one releases one's certainties about what one claims to know in order to see whether what one knows is indeed the case. The enemies of reflection are knowledge and certainty: if I think I know, I do not reflect. At the same time, we usually act according to what we claim to know. But what is „to know“? Let us reflect. As I invite you to reflect, I am not inviting you to forget what you know – what you know is your richness. I am only inviting you to open your mind to releasing your certainties. Certainty is not knowledge, it is an emotion, a relational disposition with respect to a claim to knowledge. One is certain that something is true precisely when one does not know if that is indeed the case; if you indeed know that something is the case, you do not say that you are certain, you proceed according to what you claim to be the case. I also want to call your attention to the fact that reflection is not a rational act, it is an act in the emotional domain because it arises precisely when one abandons one's certainties and is disposed to look again and without prejudice at the circumstances in which one finds oneself in one's own life. If I realize that I may not be where I think that I am, I stop and take a step to the side to look, and as I do so, I may see what my certainty obscured. Yet, to act in this way, to take a step to the side to see my present state of living, my thinking, my ideas, my desires or whatever, I must wish to do so, and that wishing is an act in the emotional domain. Only then, only after I have completed the act of reflection and I have seen whatever I see, can I develop a rational argument about what to do on the grounds of what I saw. I am not talking against reason or rationality. All I am saying is that the act of reflection is an act in the emotional domain, and that I must wish to release my certainties to become free to look again and see something new. Learning to reflect is the most fundamental relational-operational learning in human life; in fact, reflection is what makes our human manner of living of other kinds of organisms. So now please follow me down the path of reflection about ourselves that I am about to propose.

Living beings

We are living beings that, in their operation as totalities exist as organisms in a medium that contains them and makes them possible by providing all they require for their realization and conservation in their living. That part of the medium that makes the living of the organism possible is its niche. The niche, as that part of the operational-relational domain of existence that arises with the organism and which provides it with everything that it needs for the continuous realization, moment after moment, of its molecular autopoieses. The organism and its niche constitute an operational-relational unity: the organism-niche unity. The organism-niche unity is not static; it is a relational and operational dynamic entity that arises moment after moment in the realization of the molecular autopoieses of the organism so that organism and niche change together congruently and that lasts as long as the organism lives.

Living beings exist as discrete entities as they operate as totalities, that is, they exist as organisms. Life does not exist as an independent entity or process that can be added to a molecular system, and this is why, although we ordinarily speak as if it were so, we are mistaken when we speak as biologist about the origin of life. We should instead speak about the origin of living beings. The word “life” therefore cannot be properly used as if it referred to a property of living beings.

Autopoiesis

Living beings are molecular systems. If as a biologist one studies the manner of constitution of living systems, one discovers that they consist of closed networks of interacting molecules that produce the same kinds of molecules that produced them, molecules which in their interactions produce the same molecular network that produced them as a discrete autonomous molecular system that generates its own boundaries while remaining open to the flow of molecules through it. In other words, living systems are dynamic, closed molecular networks that produce themselves as discrete entities. When I realized that this was the manner of being of living systems, I was delighted and called them *molecular autopoietic systems*: living systems are discrete self-producing molecular systems. I thought that I had invented this Greek word, but I found afterwards that Aristotle had used the word autopoiesis more than two thousand years ago. Mothers know very well that their children produce themselves. Fathers do, too, but mothers are particularly aware of this because they are directly concerned with the feeding of their children. "My dear Humberto, you have to eat all the food." "Why, Mother?" "The food inside you dissolves and transforms into you." "Mother, the beans that I am eating become me?" "Yes, but not like beans. Whatever you eat is dissolved and transformed in your bones, your muscles, your nerve cells ..." "Oh mother, this means that I am autopoietic?" "Yes my child." That is to say, living beings are molecular autopoietic systems, and molecular autopoietic systems are living beings. Accordingly, the living of a living system occurs as the continuous realization of its *molecular autopoiesis*.

Structural determinism

Molecular systems are systems such that everything that happens in them and with them is determined by their manner of composition, by the way they are made, namely, by the characteristics of their components and the way that these are interconnected. The external agents impinging on them do not specify what happens in them, they only trigger changes determined by the way they are made. I have named this condition "structural determinism", and when I say that molecular systems are structured, determined systems, I am referring to this characteristic in molecular systems. When I refer to the structure of a structure-determined system, I am referring to the components and the relations between them that compose it as a totality, and when I talk of the organization of a structure-determined system, I am referring to the relations between components that define its class identity as a totality. As such, a structure-determined system can be dynamic and have a changing structure while it conserves its class identity because its organization does not change. When structure-determined systems interact, they trigger in each other structural changes, which, if they interact recursively, change together congruently until they separate, or one or both disintegrate.

Ecological organism-niche unity

When we biologists speak of organisms, we are referring to living systems attending to their operation as totalities in the medium in which they realize their living, and when we speak of the niche in which an organism exists, we are referring to the part of the medium that makes the realization of its molecular autopoiesis possible. An organism and its niche constitute an operational organism-niche unity that cannot be dissolved

while the organism lives. An organism lives in the realization of its molecular autopoiesis. Furthermore, the niche has no fixed boundaries because it is a changing operational entity that exists only in relation to the realization of the organism's manner of living. Indeed, the ecological organism-niche unity in fact corresponds to a manner of living, and manners of living are conserved and diversified through the sequential systemic reproduction of the ecological organism-niche unities that realize them. Accordingly, the evolution of living systems occurs as a natural drift in the constitution, conservation and diversification of lineages of ecological organism-niche unities through their system reproduction: what reproduces in the natural drift of living systems are the ecological organism-niche unities that they integrate.

A general consequence of the continuous constitution and conservation of the ecological organism-niche unities is that living beings and the medium in which they exist change congruently in the continuous and recursive generation and conservation of an enormous diversity of inter-crossing coherent ecological systems and biospheres when they co-exist. And a basic spontaneous consequence of this is that the whole organism transforms so that at every moment its dynamic structure implies the changing operational-relational matrix of the ecological organism-niche unity that it integrates, and, by extension, of the whole operational-relational matrix of the cosmos in which the ecological organism-niche unity that it integrates exists. This operational-relational matrix is one that an observer who has learned to look at and see can indeed see and abstract in his or her understanding. And at the same time, this continuous transformation of the organism-niche unity also implies the possibility that an observer who has learned to see his or her own niche may be able to see what other kinds of organism may be part of it.

We human beings

We human beings are molecular autopoietic systems. The realization that we human beings are molecular autopoietic systems is biologically illuminating because it shows that dying, as the end of life, is the end of molecular autopoietic autopoiesis. What disappears when a living system dies is its molecular autopoiesis: the organism stops producing itself, it dies and is no more. So, as every living being exists as a totality in the of an organism in its niche in the organism-niche unity that it integrates, every human being exists as a person in a niche that arises as he or she lives as a person in the human community in which he/she realizes his/her molecular autopoiesis. We human beings live realizing our individual molecular autopoiesis as persons in a biological-cultural medium composed of persons who also realize their corresponding individual molecular autopoiesis in themselves. We human beings do not realize our molecular autopoiesis in just any place that we can think of. We live only if, in the course of our living, we are in operational-relational coherence with the circumstances of the biological-cultural medium in which we follow the path on which our niche is continuously arising with the realization of our human molecular autopoiesis. It does not matter how we describe the different aspects of our living in the organism-niche unity in which we live as persons; we may speak of material conditions, physical conditions or spiritual conditions, yet whatever we live in our niche, we live it through the realization of our molecular autopoiesis. Everything that we human beings live, do or imagine occurs in our personal realization as molecular autopoietic human beings. As molecular autopoietic systems, we human beings realize our living through the molecular dynamics of our composition as such, but in our existence as persons in our manner of living as human beings, we are not physical entities. We exist as human beings in the biological-cultural dynamics that

we generate with other human beings as we interact as totalities in a common relational space that arises when we want to live together in a common organism-niche unity that we integrate through the realization of our molecular autopoiesis.

Everything we do, everything we think, everything we imagine, all our dreams, all our theories, all our philosophy, all our religions, all our experiences, everything good or bad that we do, every beautiful or ugly act, all art and all technologies – we human beings do all of this through the realization of our operation as molecular autopoietic systems, as we operate as totalities in the ecological organism-niche that we integrate and that arises as we distinguish it operating in it. And everything that we do always occurs in the form of behaviour in the relational space that arises in the operational-relational space of the realization of our living as molecular autopoietic beings.

How do we do what we do?

We human beings are living beings. We find ourselves being living beings when we begin to reflect about ourselves. We do not “do” our living – it happens to us. We do not make our hearts beat, our blood flow through our arteries and veins, or cause the oxygen to be carried by the haemoglobin. We do not do everything that we seem to do: we walk without doing the walking – the walking arises as result of the interaction of the cyclical movements of legs and the displacement of the ground. We find ourselves being molecular autopoietic beings; we do not “do” our molecular autopoiesis. Everything that we in fact do as human beings happens in the domains of relations and interactions in which we operate as totalities (organisms), interacting with the medium in our niche through processes that happen spontaneously in the organism-niche unity that we integrate as a result of the architectural coherences of the way we are made in the realization of our molecular autopoiesis. The organism and its niche interact as two non-intersecting systems, and in doing so, they generate the interactional domain in which the flow of their recursive interactions constitutes what we observers see as the behaviour of the organism. In this process, the organism and its niche trigger in each other structural changes that follow a course defined at every instant by the flow of the behaviour of the organism, and in which the organism and its niche change together coherently, while the behaviour of the organism follows the path in which the organism’s molecular autopoiesis is realized and the organism-niche unity is conserved. And all this occurs spontaneously, without planning, as the consequence of the operational coherence that arises as a result of the coherent structural changes that occur in the recursive interactions of an organism and its niche. As we observe a living organism in its niche, we see that its behaviour is adequate for the circumstances of its living. The organism appears to us to be behaving in a way that we could describe by saying: “It knows its medium or it knows how to behave where it is.” How does this happen? What does knowing mean here?

What is “knowing”?

How do I know, how do I know that I know? How do I know that what I say is valid and how do you know that what I am saying is valid? We live our daily lives feeling that we exist immersed in an external world that contains us and that that external world exists independently of what we do. In our daily lives, we call that external world “Reality”. And given this attitude, we live feeling that that external world is the ultimate operational-relational referent that confirms or negates the validity of our cognitive claims. In addition, we live feeling that the external world in which we exist immersed is

universally accessible to all living beings if they perform the adequate operations to distinguish it. Thus, when someone says something to us in everyday life, and we doubt its validity, we immediately ask, "How do you know?" And as we ask that, we expect as an answer a reference to some aspect of our daily life that we immediately accept as valid or, if we are not satisfied, we want the other person to describe what we should do to be able to accept the validity of what he or she claims. We have no problem with what we distinguish or do in our daily living as long as what we distinguish or do remains consistent with what we think about the world in which we live. If everything happens to our satisfaction according to what we think should be the case, we go on doing what we do until something fails in our doings and then we doubt our knowledge of the situation in which we find ourselves. When this happens, we ask someone that we think knows what is the case or that has at hand an adequate procedure that will permit him or her to have access to the Reality of what is happening. In other words, we normally act, implicitly trusting that it is always possible to have access to the procedure that will permit us to discover how things really are in themselves. We trust, in principle at least, that we have the capacity to have access to Reality because it is independent of what we do, and this is what we usually mean when we say that we are "objective" in what we say. At least, this is the feeling that we learnt to trust during our childhood and which seems to be validated by everything we do until we begin to reflect on how is it that we commit mistakes or have illusions. The traditional ancient answers about how we commit mistakes have been something like: "I did not respect the laws of the Gods." And a more modern one might well be: "I did not respect the laws of Nature". A modern physicist would say, perhaps: "The act of observing modifies that which is observed, and all we can talk about is probabilities." I propose now to invite you to reflect again on the question: "What is knowing?"

"How do we know that we know what we say that we know?" Again this reflection entails thinking about our daily life and about how we learn to know what we claim to know and how we teach our children what we teach them. Thus, the questions "Mother, how did you do this beautiful shawl?" and "Father, how do you make a table?" are marvellous questions because they show that children want to do whatever they want to do well. And when the mother and the father answer by demonstrating and/or describing a procedure, or a manner of doing which, if followed properly, would result in what one wants to do, he or she is showing that to know is adequate doing. This example reveals a fundamental inner human desire, namely the desire to do whatever is being done well, and reveals as well the basic desire to know how to do what one does well. So once again, our questions are: "What is to know?" and, "What is the relation between doing and knowing?"

Again, how do we do what we do?

What we do, imagine, think or design occurs as an aspect or feature of the realization of our living. We do not do anything if we are not living. If, for some reason, a stone hits me in the head and I fall to the ground, dead, this lecture will stop and you will have a problem: a lifeless body. Whatever we do occurs in the realization of our living while we are living. We are structured, determined systems. This means that whatever happens in us happens according to the manner we are made in our operation as structure-determined systems. We learn this in childhood and trust in it: we learn to look for distortions in the structure of our toys when some of them do not operate according to what we expect of them. Structural determinism is our fundamental, unconscious, explicit or implicit trust in what we do. If a wonderful, modern gadget like a recorder

does not work when I press the recording key, I do not go to the physician and ask him or her to examine my finger; I go to a person that understands how tape recorders are made to see if he or she can repair it. And I do this because I know that the pressure of my finger on the recording key of the recorder does not and cannot specify what happens in it. The pressure of my finger can only trigger a structural change in the tape recorder that is determined in its structure. When two structural determined systems interact, they can only trigger structural changes in each other that are determined in their respective structures. As we human beings are structurally determined systems; when we interact with each other, we do not specify what happens in or with the other as a result of our encounter, we can only trigger in him or her structural changes that are determined in his or her structure. This is why I say that I am absolutely not responsible for what you hear of what I say, but I am totally responsible for what I say and for the choice of the circumstances in which I say what I say. Every one of us is responsible, consciously or not, for what he or she says, independent of what the other hears, and each of us is also responsible for choosing the moment in which he or she says what he or she says. Moreover, we frequently become angry with another person because he or she "does not hear what we are saying", even after we repeat what we say. How many times do we think that we have come to a common understanding in a meeting and then do different things after we separate? I am sure that this has happened to all of us at one time or another, and this is not the result of bad will; it is the result of our being structure-determined systems, and nothing external to us can specify what happens with us or in us. The fact that we are structurally determined systems is not optional, it is the way we are constituted, and we live trusting that everything which happens in our living and with our living occurs in the flow of structurally determined happenings. And whenever structural determinism seems to have been violated, we investigate what did occur in an attempt to show that indeed it was not violated. Whatever we do in our daily living (philosophy, science, playing, cooking ...), we do it trusting in structural determinism and inertia; and we do so even in quantum mechanics as we look for the operational-relational coherences and regularities in the domain in which we are operating, trusting that, if we find them, what we do will be repeatable. But, if we are structurally determined beings and we cannot specify what another person will hear in what we say, how is it possible for us to understand each other? How is it possible for us to do coherent things together?

We live as valid as all that we live in the moment that we live it

We living beings in general, and we human beings in particular, live as valid whatever we live at the moment we live it. If I think that a person is lying, I live my relation with that person as if he or she were lying and I behave accordingly. If you go fishing after having prepared a hook with little, brightly colored feathers, and you throw it so that it barely touches the water, and a fish jumps to catch it, what was the fish trying to catch, a butterfly or a hook? The fish jumped, trusting that what he saw was what he saw: food. And only after having caught what he caught, could he "claim that he had made a mistake". Doubts arise only after having lived as valid something that for some other reason or circumstance is afterwards felt as not valid. We human beings reflect when we doubt and we can do so because we human beings live as languaging living beings that exist immersed in languaging, and we have learned to live in languaging from the moment of conception on as we grew up with our parents in our languaging families. How? How do we learn languaging if we are structure-determined systems?

If we want two or more structure-determined systems to interact in such a way that they would trigger in each other coherent structural changes, we design and construct them to do so. At the same time, if two or more structure-determined systems interact recursively, they will spontaneously transform together congruently while they remain in recursive interactions. A process is repetitive when it occurs again and again, in a succession in which each occurrence is unrelated to the previous one. And a process is recursive when it occurs again and again in a succession in which each occurrence occurs on top of the consequences of the previous one. In a repetitive process everything remains the same, and there is no history. In a recursive process there is a continuous transformation around something that is conserved, and there is history: historical processes are recursive processes, and recursive processes are historical processes. Living is a historical process in which the manner of living transforms continuously around the conservation of the continuous realization of molecular autopoiesis of the organism in the organism-niche unity that it integrates. Most interactions between structure-determined systems are recursive and result in a spontaneous dynamic in which the participants transform together congruently, giving rise to recursive processes of coherent behaviours. The interactions between an organism and its individual or ecological niche are recursive while the organisms realize their molecular autopoiesis and the fundamental consequence is the coherent transformation of all the entities and processes that participate in it. The coherent operation of any living system in the changing circumstances of the history of their living is always the result of their coherent structural transformation in the individual and ecological organism-niche unities that they integrate in the history of the realization of their molecular autopoiesis, and not the result of a design. So, the fact that we generate coherent behaviours, and understand each other in the different circumstances of our coexistence is always the result of a history of recursive interactions in our being together in the realization of our living in a common niche in which each one of us has been and is part of the niche of the other.

Language and conversations

From the moment of conception, a human being encounters a world of languaging, particularly in spoken form, that is a form of languaging that in fact involves all possible dimensions and manners of interaction. What is language? Or rather, what is languaging? If we observe what we do in language, we find that what we do is to flow in our living together in recursive consensual coordinations of consensual coordinations of inner feelings, desires and doings in whatever domain we may find ourselves living together. As structure-determined systems, "what we do" does not and cannot refer to something that we may wish to call an dependent reality. Therefore, language cannot be considered to be or to operate as a system for symbolic communication about "Reality", as is usually thought. Language occurs as the flow of realization of our living together in consensual coordinations of consensual coordinations of inner feelings, emotions and doings in the happening of our doing together whatever we do together as human beings. That is, language occurs in the flow of its happening, and this is why we speak of languaging. Therefore, languaging is not an abstract phenomenon; it occurs with the concreteness of the flow of what we do in the different domains of consensual coordinations of consensual coordinations of feelings and doings that we live in the processes of the realization of our molecular autopoiesis in the shared organism-niche unity that we integrate in a human community. At the same time, as languaging beings we live doing what we do in different networks of languaging, each defined by some

different dynamic of emotional configurations that guides the course of the flow of the coordinations in which we are involved. Everything we do as human beings, we do in networks of conversations: when we study for a profession, we study a network of conversations; different cultures are different closed networks of conversations that define everything we do, and when we go to live in a different culture, we go to live in a different closed network of conversations. Yet, cultures are not fixed: they change and transform as they are conserved from generation to generation in the learning of the children in the ecological unity that they integrate.

In the process of cultural transformation in human history, different networks of conversations began to be conserved as different psychic attitudes. Three of these are of particular interest in our present reflections. One is the network of conversations in which explanations arise, another is the network of conversations in which the notion of "Reality" arises as the transcendental fundament of everything, and the third is the network of conversations in which ethical concerns and moral obligations appear. The conversations pertaining to explanations attempt to evoke processes that would show how something happens as a consequence of something else. The conversations about Reality as the transcendental fundament of everything attempt to satisfy the feeling that there must be something that unifies all aspects of the diversity of human experiences. And the conversations on ethical concerns and morality attempt to evoke the feeling that there are process relations that have to be respected for the conservation of the well-being of all human communities. No doubt these and all other conversations must have arisen in relation to what was being lived in the different operational-relational domains in which our ancestors went about their daily living. No doubt nowadays we may call some of these operational-relational domains abstract because of our present manner of thinking about our possibility of saying something about something that we think exist independently of what we do as we distinguish it, but early humans might have lived closely with them as aspects of their daily living, aspects that mostly no longer exist.

But where do we live? What kinds of worlds do we inhabit or generate in our living?

What is scientific knowledge?

We look, we hear, we touch ... What kind of worlds do we live in? We have illusions and we make mistakes. When we see something and doubt what we see, we try to touch, when we touch and we doubt what we touch, we try to listen, when we hear and we doubt what we hear, we try to smell, and when we doubt our smelling, we try to taste ... and we taste and we doubt our tasting, we ... try to see ... What do we see when we see? Living beings treat whatever they are living as valid at the moment of living it. We human beings live whatever we are living as valid at the moment we in which we live it. In fact, we call illusions experiences that we treat as valid at the moment that we live them, and that we invalidate later when we compare them to other experiences, which we choose not to doubt. The same happens with errors or mistakes: when we do what we do or live whatever we live, we do not know whether we shall later say that what we did or lived was a mistake, an error or an illusion when we compare it with something else which we do not doubt. And not only do we not know, we cannot know. Similarly, when we say that we perceive something with our senses, we do not know whether we shall later say that we made a mistake. Therefore, we do not know and cannot ever know at the moment that we live as valid, whatever may be what we live, whether we shall say at some other, later moment that what we lived was a perception or an illusion when we compare it with other experiences which we prefer not to doubt. Illusions,

errors, mistakes, and perceptions in themselves are not such, they arise when we compare experiences and choose to accept one or the other as a valid reference. And that this is so is not a failure of our nervous system; it is our condition of constitution. What does “knowing” mean then?

Our sensory organs do not and cannot tell us anything about things that are independent of what we do when we distinguish them. Nor can instruments do so either because instruments only do what we specify them to do in the space of our operations as structured, determined molecular autopoietic systems in the realization of our living. This means that all the instruments that we may ever design or imagine designing will operate in the same domain of structural determinism in which our molecular autopoiesis takes place, generating the niche in the organism-niche unity in which we exist, and which we generally call the physical domain. Therefore all the instruments that we may design operate the same as our sensory organs. Linguaging is not and cannot be an instrument that we could use to tell us something about an external Reality either, and this is because it occurs in the flow of our recursive consensual coordination of consensual doings in the community niche in which we become human beings in the realization of our molecular autopoiesis. If you are a mother or a father, and a visitor comes, you may say that your ten-month old baby girl understands everything that you say, for example, when you tell her “I shall bring your mild” and she calms down. You do not describe the bottle in which you bring the mild, you talk and play with your baby while feeding her, you coordinate your doings with your baby, and as the baby grows, living with the mother and other members of the family becomes a progressively more complex system of recursive coordination of consensual doings. And as this happens, at some moment you touch the nose or the ears of the baby saying “nose, “ear” ... and guide the hand of the baby to touch your nose and your ear while you say “nose” or “ear” in a process that results eventually in that the baby learns about her body and begins to talk about it the baby learns to distinguish herself as she feels and does things together with you in an enriching process of coexistence in such a way that later, when she is about two years old, you can ask her: “Little Lisa, do you see what your are doing?”

What actually does happen in our daily lives when we ask little Lisa to look at what she is doing? What happens is that she stops what she is doing and turns her attention to herself, looking at what she was doing and at the circumstances in which she was doing it, in an act that we in our daily living call reflection. This she learns to do when playing with her mother and father or family in precisely that kind of conversation. As languaging beings, we humans learn to reflect in circumstances where what is happening in our life is unexpected and surprises us. The act of reflection always puts us in an operational-relational domain different from the one in which we were originally, and in which what we do or are able to do cannot be deduced from the operational-relational coherences of the domain in which we were initially. And if we learn to reflect as children, we can reflect on what we do in every circumstance as adults, and when some other person tells to us, “You know how to reflect. Can you teach me, please?”, we can answer “yes”. But what do we do when we teach? We show the person how to do what we think he or she wants to learn in a manner that we consider adequate according to what we consider as the adequate manner of doing it. Cognition has nothing to do with what we might call “transcendental Reality”, but has to do with that which we accept as valid in what we do. Indeed, we usually call reality those doings that we accept as valid in our daily living. In these circumstances, when we speak of knowing or knowledge, we refer to those doings that we accept as valid because they satisfy some criterion of validity that we put forward to accept them. Knowledge has to do with the doings that we accept as valid, and not with a reference to some transcendental Reality:

knowing is to be able to do those doings that are accepted as valid according to some criterion of validity that is accepted as valid.

Accordingly, scientific knowing is then doings, reflections and explanatory propositions accepted as valid because they are validated with the criterion of validation of scientific knowing.

What is the difficulty in understanding cognition?

The difficulty in understanding cognition arises from our feeling that when we speak of knowing, we must be referring to some ability or capacity that we human beings should have in order to act adequately in relation to a transcendental domain of existence that contains us and that we call Reality. And this is so because we live in a culture in which knowledge of Reality seems to be essential for us to be able to adequately live in it. But according to all that I have shown to you, in what I have said, and given the facts that we living beings exist as structured, determined systems and that we do not distinguish in the experience between what in daily living we call perception and illusion, we cannot claim to be able to say anything about something that we assume to exist independently of what we do when we distinguish it or talk about it. No doubt in our present cultural manner of living, we act with the feeling that something transcendental should exist that is external to us and is independent of what we do, but is still accessible to the cognitive abilities of all living beings, a domain of transcendental existence that we call Reality and that we would like to use as a universal referent to validate all our cognitive claims. But as I have already said, this does not happen and cannot happen because there is no way in which we could do anything in a domain of existence different from the operational-relational domain in which we exist as molecular autopoietic systems. Moreover, this is no circumstantial deficiency or limitation that could be overcome with technology; it is a constitutive condition of our existence as molecular autopoietic beings. Furthermore, everything we do and can do with technology, we do in the operational-relational domains that we generate in the recursive networks of conversations in which we human beings exist as languaging molecular autopoietic systems. But if we, as languaging beings, live in networks of coordinations of coordinations of consensual doings and emotions, what are doings? What are emotions? What is knowing then?

We find ourselves as living beings when we begin asking about ourselves, and we find ourselves having done all the wonderful and terrible things that we human beings have done in the name of knowledge and Reality when we ask ourselves about cognition and Reality. After all we have said, and after all the reflecting we have already done, we shall see that if we attend to what we do when we speak of cognition, we will find: a) that we say that a person (who could be ourselves) knows what they are doing when we think that they are doing what they are doing in a manner that we consider adequate at the moment and in the circumstances in which we are observing them; b) that we accept their behaviour as adequate because we see that what they are doing is what we would have done in those circumstances and at that moment; and c) that we ask how to act to a certain thing and at that moment when we want to learn something that we think another person knows. In fact, in daily life we say that a person knows when we see them behaving in a manner that we consider adequate in what we consider to be an adequate moment. This is why, when a person wants to study a subject, a profession or a manner of thinking, they go to a human community that practices the corresponding network of conversations, and if a person makes a discovery or invents something, they have to generate a network of conversations in which the discovery or invention has validity.

Common knowledge occurs as a network of conversation that coordinates consensual doings under the inner feelings that generate a relational space of cooperation in the trust that some particular shared criterion of validation is being satisfied in what is done.

Where do actions take place?

Languaging occurs as a recursive flow of coordinations of coordinations of emotions, doings and feelings in networks of conversations. What are doings, feelings and emotions? What has the nervous system to do with cognition? We find ourselves living in networks of conversations when we try to explain and understand how we do everything we do as human beings, and how we generate the different worlds that we live in as we live them. Moreover, we find that we explain what we do in our lives with what we do in our lives, that is, we find that as scientists we explain the operational coherences of what we do in our daily lives and in technology with the operational coherences of the realization of our living as molecular autopoietic systems. Let me be clear about this with respect to explanations in general, and especially with respect to scientific explanations. An explanation entails two operations: a) the proposal of a process that, if it were allowed to take place, it would give rise, in the experience of the person (the observer) who proposed it, to the experience that they want to explain; and b) the acceptance of that process as an explanation by the person (the observer) who proposed it, because the proposal itself satisfies some criterion of validity that leads the person to listen to it.

Indeed, you can see that you do this in your daily living, and you can also see that when you study a profession, you learn in the network of conversations that constitute it not only the doings, but also the criteria of validation for the explanations and statements valid in it. Scientific explanations differ from other kinds of explanations of daily life only in the particular criterion of validation that constitutes them. And scientific statements differ from other kinds of statements that we make in our daily life because they are supported by scientific explanations: that is, what constitutes an explanation as a scientific explanation is the criterion of validation that the scientists use in their explanations, not in the nature of the experience that they may be attempting to explain. To be precise, we can say that the criterion of validation for scientific explanations consists in the coherent satisfaction by the person that is attempting to make a scientific explanation of some experience: a) the description of what a person (observer) must do to live the experience that he or she wants to explain; b) the proposition of a process or mechanism such that, were it allowed to operate, would result in the observer living the experience that he or she wants to explain; c) the deduction, on the basis of all the operational-relational coherences implied by b), of other possible experiences that he or she may live and of what he or she should do to live them; and d) the realization of what has been deduced in c), and if that happens, then b) is a scientific explanation. This is what we scientists do, not necessarily what we think or say that we do, and a scientist is a person who likes to explain using the criterion of validation of scientific explanations to explain or to validate his or her explanatory proposition. Please note that scientific explanations occur in the domain of our daily living as an aspect of the realization of our molecular autopoiesis, with no reference or need of reference to any transcendental, independent domain of entities. The power or value of science in our lives rests precisely on the fact that it has to do with the realization of our living as molecular autopoietic systems. Thus, the subject of our scientific explanations is everything that we do in the realization of our living as molecular autopoietic systems.

As we have seen above, we human beings continuously generate in our reflections new operational-relational domains in which new elements and relations appear that give rise to processes that could not have been deduced in the operational-relational domain in which we operated before reflecting. Indeed, this happens whenever a recursion takes place in our doings. Moreover, the new domains that arise in the recursive processes that happen in the realization of our living as molecular autopoietic beings appear as new manners of living or new operational-relational domains that entail new ways of ordering what we do or think in our niche. In the dynamics of our organism-niche unity, this results in the arising of new domains of operational-relational-logical coherences that, in the realization of our living as molecular autopoietic beings, constitute new kinds of entities and processes that we live as different matrices of operational-relational existence.

In these circumstances, what are we talking about when we speak of Reality? The word "Reality" comes from the Latin word "Res", which means "thing", or entity, and we use this word to refer to a domain of entities and processes that are thought to exist independently of what we do as human beings as we distinguish them. But as we know now that we cannot say anything about anything that we think exists by itself independently of what we do when we distinguish it, we know that the notion of Reality is an invented explanatory proposition that, if it does what we think it does, would permit us to claim that what we say is universally valid. From all that I have said already, it should be apparent that I think that it is not so, and that I think that knowledge, explanation, behaviours, scientific theories and so on are not related to an independent Reality, but are related to our operation in the worlds that we generate in the realization of our living as languaging molecular autopoietic systems.

Accordingly, actions do not occur as operations in or upon an external independent Reality, but occur as inner processes in the different operational-relational domains that arise as self-contained recursions of doings, reflections and conversations in the flow of the realization of our human living as persons in the organism-niche unity that we integrate, either alone or in an ecological community with others. And all this occurs as a continuous historical transformation of our manners of living in the realization of our molecular autopoiesis. In these circumstances, then, what is the role of the nervous system in the flow of our cultural transformation?

The nervous system

In the course of finding ourselves as living human beings asking about the nervous system, we have until recently looked at it as an organ that operates as part of the organism, providing representations of the medium in which this is immersed, and realizes its niche. Biologists usually think of the nervous system as an organ that makes representations of the medium that it uses to generate and coordinate the behaviour of the organism in its niche. Given everything that I have already said, we now know that the nervous system cannot and does not make representations of the medium, and does not operate by computing the behaviour of the organism.

The nervous system operates by generating internal, changing relations of activity between its components and closed sensory effector correlations that modulate the interactions of the organism in its niche. Since organism and niche change together congruently in the flow of their recursive interactions, the sensory and effector correlations generated by the closed dynamics of the nervous system either result in that the behaviour of the organism is spontaneously adequate to deal with its changing relations in its niche in all circumstances, or in that the organism disintegrates when

that does not happen. In us languaging human beings, the different networks of conversations that we live are part of our niche, and constitute at every moment of our human existence the different operational-relational worlds that we inhabit. Worlds that an observer sees as different manners of operating as well as different configurations of inner feelings and emotions that the persons who live them live. Moreover, the observer also sees that these different worlds that we live in the organism-niche unity that we integrate, individually or in a community with other living beings, constitute the different operational and relational domains of existence that we call daily living, languaging, conversations, philosophy, mathematics, classic and quantum physics, reflections, explanatory theories, biology, etc. – domains of existence that we live in the flow of the realization of our molecular autopoiesis.

In these circumstances, everything that the nervous system does as part of the operation of the organism in the organism-niche unity occurs as a modulation of the flow of the realization of the organism's molecular autopoiesis, so that the different worlds that arise in our living as human beings reveal only the operational-relational coherences of the operational-relational domain of the realization of our molecular autopoiesis in the organism-niche unity that we integrate in the realisation of our living. Therefore, all that we can say about the participation of the nervous system in our evolutionary history is that it has made possible the enormous internal structural diversity and plasticity necessary for our living in languaging and conversation, creating all the different operational and relational worlds that we live as different operational and relational worlds that we live as different manners of operation in the organism-niche unity that we integrate, without connecting us with anything outside the domain of the realization of our molecular autopoiesis. And we can also say that the different manners in which we operate in the organism-niche unity, that we integrate alone or with others, constitute the different worlds that we feel ourselves living in the different things that we do.

Nothing that we do can reveal or connect us with something that we imagine exists independently of what we do and which we could treat as a universally accessible referent to validate what we say or do, a referent that historically we have called Reality. Everything that we human and non-human living beings do, alone or with others, occurs in the domain of the realization of our individual molecular autopoiesis in the organism-niche unity that we integrate. And the nervous system participates in the continuous generation of the sensory effector correlations of the organism that result in its behaviour in its niche continuously following the path in which molecular autopoiesis is realized in its ecological organism-niche unity. This process occurs spontaneously, without design or intent, as long as the organism in the organism-niche unity that it integrates follows the path of the inner sensory effector correlations that conserve its inner feelings of well-being. The medium in which we, in our reflections, think that the organism-niche unity has to exist and operate is an imagined, transcendental domain not accessible to our operations of distinction, so we cannot say anything about it, not even that it can exist in the terms in which we speak of existence. Yet, although we know that we cannot say anything about such imagined domains of transcendental existence, we act under the feeling that it is just such an imagined medium that provides the operational fundament for the operational-relational coherences that appear in everything we do in the realization of our molecular autopoiesis, and in our explaining of all that we do with the operational-relational coherences of what we do in the realization of our molecular autopoiesis. It is this imagined domain of fundamental existence what we have traditionally intended to evoke with the notion of Reality, believing that we can know it at least indirectly.

But if we cannot speak about an independent Reality, what do we speak about when we speak of knowing? What is knowing then?

What is our theme – cognition or reality?

After all I have said, the answer to these questions is in essence basically simple: everything we do occurs in the operational-relational domain of the realization of our molecular autopoiesis. And everything we think, imagine or feel has consequences or affects us in the domain of the flow of the realization of our molecular autopoiesis. In other words, the realization of our molecular autopoiesis is all that there is. Everything that we distinguish or we say that happens occurs through us in the realization of our molecular autopoiesis. Let us consider some particular domains of our doings: *the domain of quantum physics* is the domain of operational-relational coherences that we see appearing, implied in the constitution of molecules when we analyse them as observers through our operation as molecular autopoietic systems; *the domain of the biological* is the operational-relational domain that we see appearing through our distinctions in the domain of the operation of molecular autopoietic systems as a consequence of the recursive composition of molecular systems, and that we see occurring when we look at the molecular interactions as we operate as human molecular autopoietic systems; *the domain of our human living in languaging* is the operational-relational domain of human living in consensual coordinations of consensual coordinations of inner feelings, relational doings and emotions in human living, and that we see occurring when we look at the flow of our living in conversations as we operate as molecular autopoietic observing beings; the domain of thinking and reflecting occurs as an aspect of the realization of our living in the domain of the recursive internal correlation of changing configurations of relations of activities of the nervous system as it operates as a closed network of changing relations of activities that give rise to the sensory effector correlations that constitute our behaviour in the organism-niche unity that we integrate, and that we distinguish when we look at the internal process that gives rise to our operations as totalities while we operate as molecular autopoietic observing beings. I speak in this circular manner because I want it to be apparent that what we call abstract thinking occurs through the (internal) dynamics of our operation as molecular autopoietic systems and gives rise to our operation as totalities in our behaviour in the ecological organism-niche unity as this arises in our operation as molecular autopoietic systems. All the different worlds that we live in arise in our living them and involve our whole body dynamics in a relational dance in which the same or similar movements are performed again and again, but have different operational-relational meanings in the flow of the realization of our living because they occur at different historical moments in the different and changing “choreography” of the realization of our molecular autopoiesis that each of those different worlds is. Moreover, this is apparent in that the sensory-effector configurations that we connote in our conversations to evoke an understanding of what we do in the different operational-relational domains of the different worlds that we live in are similar in the evocation of the ordering of the operational-relational dimensions of the space in which they occur. That is, we generate everything in all the worlds that we live in as we realize our molecular autopoiesis operating as organisms in the ecological organism-niche unity that we integrate. Each world that we generate, however abstract or concrete this may appear to us as we observe it, occurs as a flow of a manner of living through the operational-relational dynamics of our “body-hood”. And this is so because the operational-relational foundation of everything we do as human beings while realizing the different worlds that we generate in our living (be this daily living,

philosophy, mathematics, religion, art, science or technology) is ourselves in the realization of our living as molecular autopoietic systems (beings).

This is what I am referring to when I speak of *fundamental relativity*. There is nothing outside the realization of our molecular autopoiesis because everything occurs through it. Nothing new appears as something different that does not pertain to the operational-relational dimensions of the operational-relational coherences that we discover as we analyse the molecular autopoietic systems operating as molecular autopoietic systems. Thus, *fundamental relativity* rests on the fact that we explain ourselves as human living beings with what we do as we operate as human living beings, without requiring any other basis. It is our spontaneous operation as molecular autopoietic systems that defines and reveals the operational-relational space in which we exist as spontaneous as spontaneous molecular autopoietic systems. If this statement sounds tautological, it is because it is tautological – as all scientific statements are as they are explanations of what we do in our living with what we do in our living without ever having to refer to a transcendental Reality.

Therefore the fact that we find ourselves, languaging human beings, with other human beings when we ask about our living, and that we find that we are molecular autopoietic systems with the operational-relational coherences of our operation as molecular autopoietic systems, shows that this is our condition of existence. Moreover, this also shows that the domain of operational-relational coherences of our realization as molecular autopoietic systems is the domain of existence, is the cosmos that arises as we explain our existence as molecular autopoietic systems with the operational-relational coherences of our existence as molecular autopoietic systems.

Transcendental Reality or transcendental Truth?

We live acting according to our inner feelings, desires, emotions ... We find ourselves living with others in languaging and conversations in which we talk about our spontaneous feeling that we all exist immersed in an external world that contains us and that we call the Reality or The Truth. Furthermore, we find ourselves treating that external world that we feel as the ultimate referent for our cognitive claims. Yet, everything said so far shows us that we can say nothing about the external Reality or Truth that we feel because everything we feel and do occurs as a closed dynamic of operational-relational coherences in the domain of the sensory effector correlations of the realization of our molecular autopoiesis in the ecological organism-niche unity that we integrate as living beings. Moreover, we find ourselves reflecting in conversations with others about what knowing is and about acting in a world that is regular and coherent and at the same time permits unexpected events that we feel come from an external, independent Reality. As we reflect, we find ourselves as human beings that do not exist in solitude; we find ourselves existing in communities of human beings who live in recursive networks of languaging and conversations in a manner of living that occurs and is conserved only in its continuous realization as a human community of that kind. Moreover, we live in the way we find ourselves living as a matter of course, and there is no conflict between that and our feeling of comfort with what we do in our living. A conflict arises only when we find ourselves living unexpected events that we cannot explain with the operational-relational coherences of our present way of living, and to recover our psychic harmony, in the past we invented Reality and the Truth as transcendental domains of existence external an inaccessible to us in our ordinary daily living that we treat as universal ultimate reference for the validation of what we do. But even as we do this, we do not feel totally comfortable because we feel that we are

preserving some fundamental contradiction, the result of which is the fragmentation of our communities through the generation of dogmatic doctrines that justify discrimination and tyrannies.

My presentation at this conference has consisted of showing that all unexpected events can be understood as part of the worlds that we generate in our living as aspects of the spontaneous realization of our molecular autopoiesis, if we stop asking about Reality or Truth and instead ask about how we do what we do and feel what we feel. Or if we ask the same thing by asking: What are knowing and cognition as biological phenomena? How do we live in the worlds that we generate, living as molecular autopoietic beings? By doing this, I have shown that the scientific answer to these questions does not require the use of any ontological supposition or suggestion about a supporting external *Reality* or a transcendental *Truth*. And I have shown that this is so because these questions are about how we human beings do what we do, and therefore their answers are to be found in our understanding of what is common to all the different worlds that we generate and live as *molecular autopoietic systems* in the realization of our living in the ecological organism-niche unity that we find ourselves integrating, that as such constitutes the central operational referent for everything that we feel and do, and which I have called *fundamental relativity*.

What we find in the realization of our humanness as human beings is that the unexpected happenings, which appear in the course of realizing our living in the ecological organism-niche unity that we integrate, change the operational-relational matrix of the realization of what we do in it, but do not and cannot tell us anything about the external *Reality* or *Truth* in which we suppose ourselves to be immersed. As all that we live in the realization of our living in the ecological organism-niche unity that we integrate changes, our inner feelings about what we do and feel change as well. And as our feelings about what we do change, our doings recursively change, changing our domains of knowing; and as our domains of knowing change, our manner of living changes as well, changing the worlds that we live in a recursive flow of change of what we feel in our daily living as the happenings that constitute the actual or real aspects of the worlds that we live.

We do not generate the worlds that we live in arbitrary acts of creation in which we think about every detail of what we do; our manner of living happens to us as we live our niche, conserving our manner of living, on a path that arises moment after moment guided by the modulation of our sensory-effector coordinations by our inner feelings through the desires that they give rise to. So, our responsibility in the worlds that we generate as our manner of living while we live them does not reside in what we do, but in our desire to do what we do, given the fact that we can always reflect on the possible consequences of what we do. Our feeling of shame, sadness, pain, regret or guilt for some of the consequences of what we do does not rest on our awareness of having violated some transcendental norm, value or law because these do not exist as aspects of the realization of our living. If at any moment, we feel shame, sadness, pain, regret or guilt for what we have done or thought, it is always the result of our becoming aware of the negative consequences for the worlds that we generate with our manner of living when we violate some aspect of the relation of self and mutual respect that is, for us as loving human beings, the intrinsic foundation of our social existence in whatever world we may generate. And, finally, reality as the actual happening of our living in the realization or our living as human beings in the domain of our existence as molecular autopoietic systems is not in contradiction with our spiritual or mystical inner feelings, since we live as valid whatever we happen to live in the realization of our molecular autopoiesis in the ecological organism-niche unity that we integrate. We as human

beings are everything we live, and everything we live is everything we are, and in this sense we are all the reality that is.

Nothing is in itself; every single thing that occurs as an aspect of the realization of our living, whether through our doings, explanations or imagination, arises in the operation of distinction with which we bring it into existence. No doubt in our inner feelings we live what we distinguish as if it were there before we distinguished it, and in our daily living we speak of discovery or unveiling when we are surprised by what appears in our distinction. Yet, what I find beautiful is that we live as valid whatever we live, and I am careful in whatever I say or do out of respect for all those beings and things that appear unexpectedly in my existence with what I say or do as if they were coming from somewhere else, and which nonetheless are myself in the realization of my living as a molecular autopoietic human being.

Implications of the understanding of fundamental relativity

What I have shown in this presentation is that, if we want to explain all that we do, think or imagine as human living beings scientifically, we find that we explain the operational-relational coherences of what we do in the realization of our living with the operational-relational coherences of what we do in the realization of our living. Accordingly, what fundamental relativity tells us is that we are the operational-relational foundation of all that we can talk and do, including of ourselves as human beings doing what we do, because everything that we distinguish arises through our operations of distinction as languaging molecular autopoietic beings that arise in the ecological organism-niche unity in which we arise as we distinguish our own living. What are the main implications and consequences of accepting what I have shown at this conference? Let us look at some of them.

Nothing that we feel or do is irrelevant in the flow of our living.

Everything we do, we think, we feel, we imagine, we desire or we fear, that is, everything we live, we live it as valid in the moment that we live it, regardless of whether we later may invalidate what we lived, saying that it was a mistake or an illusion. And as this happens - because in the flow of our living we do not distinguish between what we call perception and illusion - our emotions, our doings, our thoughts ... our body-hood, the whole dynamics of our living occur continuously following at every instant a path by the feelings that we are living at that instant. In other words, nothing is trivial in our living because the course that our living follows is continuously defined by our feeling, regardless of whether we may think afterwards that what we lived was an illusion. Furthermore, since whatever distinction we make, whether conceptual or operational, brings with it the operational-relational matrix in which it exists (occurs), every change of feelings, emotions and doings brings forth the operational-relational matrix in which that world exists as a domain of human habitation. And since we human beings are the operational and relational origin and fundament of all the different worlds that we generate with our living, the cosmos that we generate with what we do in our lives changes continuously like a continuously changing present.

Humanness occurs and is conserved in human community life. Human communities as domains of human coexistence are the domains in which we human beings generate through our manner of living the worlds that we experience (live) together as cultures. And what we feel, think or imagine in the cultures that we generate, integrate and

conserve in our living modulates the course of transformation of the worlds that we generate as we live together and alone in a continuously changing cultural present.

Operational-relational matrices

When we make a distinction, with the operation of distinction that we make arises that which we distinguish and, at the same time, implicit in what we do in the act of distinction, the operational-relational matrix in which that which we distinguished occurs and makes sense for us. It is from this fact of our daily living that we can claim that we living beings live the worlds that we live in the changing flow of our living as different dynamic operational-relational matrices that at every instant imply everything that each living being can do at that instant. What is peculiar to us human beings is that, as languaging beings, we have become aware of this, and we can always expand our vision and reflect about the different cultural manners of living that we realize in the different dynamic operational-relational matrices of the different worlds that we generate in our living, and we can choose whether we want to live them or not. Moreover, all the different dynamic operational-relational matrices that we living systems live and can live pertain to the domain of existence implied by the operational-relational domain of the realization of our molecular autopoiesis. Indeed, it is because of this that we human beings can deduce everything that might happen in them at any one moment of our living in them if we can abstract the configuration of operational-relational coherences of the moment in which we are doing what we are doing in them. Furthermore, it is because of this that if we in fact manage to abstract the configuration of operational-relational coherences that constitutes the nature of what is happening in any particular situation of our living, we can deduce what will happen in its transformation when the configuration of operational-relational coherences that defines it is conserved. In fact, this is how mathematical formalisms permit us to deduce what may happen in the different worlds that we generate in our living, and how we human beings have generated different sciences and technologies as domains of understanding and of adequate actions in the cosmos that arises with what we do in our human living.

Reflections change the course of our living

Since we as human beings exist in languaging and conversations in the worlds that we generate as ecological domains of existence, alone or in the communities in which we live our living, we can reflect on what we feel, think or imagine, and we can choose what to do according to our desires, wishes or preferences at the moment of living it. As a result of this, we human beings are responsible for the worlds that we generate with our manner of living because these always follow the path that we unconsciously or consciously adopt according to our implicit or explicit desires.

Our inner feelings define the worlds that we live

What I am saying in these reflections is that the understanding of the worlds that we generate as we live them leads us to realize that reality, as the fundament of the validity of whatever we claim to know, is whatever we live in the realization of our living as molecular autopoietic systems. And I am saying at the same time that when I talk of fundamental relativity I am referring to the fact that our living as molecular autopoietic beings makes us the fundament and the generators of everything there is, because all that we can see and say is everything that there is arises as we describe and explain our

living with the operational-relational coherences of the realization of our living. Furthermore, I am saying as well that everything that there is in the worlds that we live arises in the course of our living defined moment by moment by our desires as they arise from our inner feelings in the realization of our living in the operational-relational matrix that they bring forth.

Certainty and uncertainty

The claim that something is or is not the case or valid depends on the criterion of validity that we use to support our claim at any moment. Certainty and uncertainty are expressions that refer to our confidence or lack of confidence in what we claim to know, particularly with respect to what we may be expecting to happen in the future. We do not, have not, and cannot ever be fully certain about what will happen in our future. According to what I have said about *fundamental relativity*, we generate the worlds that we live as we live them in the particular ecological organism-niche unity in which we realize our living and our predictions and deductions about the flow of our living in the operational-relational matrix entailed by our being molecular autopoietic systems. Yet, we frequently find that unexpected events appear in our living that we could not have predicted because, although they were occurring in the operational-relational matrix of the realization of our molecular autopoiesis, they arose outside the ecological organism-niche unity in which we were realizing our living and in which we were making our deductions and predictions. So fully predicting the course of the flow of our living is impossible for us because the course of our living will always remain open to the contingent encounter with unexpected processes that have an historical origin in the operational-relational matrix of our existence as molecular autopoietic systems outside the ecological organism-niche unity in which we realize our living. In these circumstances, even though we may live feeling that the course that our living may follow is always uncertain, we know that it will always be a course open to being modulated by our unconscious and conscious desires, if we reflect. Indeed, the notions of certainty and uncertainty do not refer to our knowledge, but they do refer to our confidence in what we claim to know.

Choices and free will

Under the circumstance that we human beings in the realization of our living as molecular autopoietic beings are the operational-relational source of every thing in the basic generative relation that I have called *fundamental relativity*, we never face infinite alternatives. Accordingly, whenever we reflect about our present, we find only the alternatives offered to us by the operational relational coherences of the actual realization of our molecular autopoiesis at that moment, so we can only choose from those alternatives, and we can only do so according to our desires in the instant that we face them, unless we reflect about our circumstances. If we do reflect, we become conscious of the domain of our choices and we become aware of them as well as of our desires, preferences or purposes and of whether we like or do not like our desires, preferences or purposes, creating in that moment the possibility of choosing without the intervention of an external determination. The expression *free will* refers to an action or choice taken after a reflection in which one has asked oneself whether one wants or does not want what one wants. Since we cannot make any appreciation or “prediction” about our future of which we could be absolutely sure, whenever we reflect about whether we want what we think that we want, we find ourselves acting according to our

desires in free will without being predetermined by any external directing process in the act of choice. In other words, whenever we find ourselves considering (reflecting on) whether we want or do not want to do what we are about to do in the realization of our living as molecular autopoietic beings, we find ourselves in a domain in which we choose according to what we want to be the consequences of what we do, we chose in *free will*. In other words, free will is in fact a central aspect of our humanness that we cannot avoid. If we act as human beings, we act in free will; it is only when things happen to us outside of our possibility to reflect that we do not act as human beings, and we do not act in *free will*.

Responsibility

The understanding of fundamental relativity shows us that we human beings exist in a domain in which nothing external to us guides our living or determines the course that it follows or what we do in it independent of our desires and preferences. This means that our actions are always the result of our own conscious and unconscious choices, and that, in that sense, we are always responsible for what happens in the worlds that we generate with our living. But this also means that when we reflect and chose according to our inner feelings and desires, we can also reflect on our inner feelings and desires and act according to whether we like them or not, and choose to accept or reject what we have chosen. That is, we can always choose to be honest and responsible about the worlds that we generate in our living because we know that those worlds are we, and that we are they. And since that possibility of choices is the essence of our fundamental human freedom and is not a moral demand, it is also the fundament of our well-being as biological-cultural beings in the ecological organism-niche unity in which we exist. We human beings always do what we want to do even when we say that we do not want to do what we are doing. Our human freedom is not to have infinite possibilities, but to know that we can always reflect on what we do, asking ourselves if we indeed want to do what we claim that we want to do.

Human beings are born loving beings

What is peculiar to human beings is that the ultimate reference for their choices in conflicts of desires is their biological condition of being loving beings that are born as such at the present of the evolutionary history that gave origin to them. Love occurs in us humans as a spontaneous relation of care for the well-being of others that leads us to avoid hurting them with what we do in a manner of acting that we call ethical behaviour. Love and ethics are spontaneous configurations of our inner feelings of care for the well-being of others, and do not require any rational justification. Love and ethics are the ultimate referent for our free will choices when we face a conflict of desires, provided we do not act under the spell of having accepted a rational theory that denies them. Understanding the nature of the domain of fundamental relativity shows us that there is no need for any rational or emotional justification of our loving and ethical relational behaviour because, as their fundament is love, they arise as spontaneous behaviours in the vision of love unless we choose to deny them under the justification of some theory that, by negating the legitimacy of the other, negates love.

Theories

As I have said, we human beings as biological-cultural beings can reflect on what we do and we can choose what to do according to whether we like or do not like what we are doing. As self-reflection, reflection about oneself and what one is doing, requires living in languaging and conversations, we human beings are in this respect different from all other living beings that do not live in languaging and conversations. Do I want to do what I want to do? ... is a fundamental question in human life, and it is so because what guides our living are our inner feelings and the emotions that they sustain: desires, purposes, fears, preferences, dislikes, anger, worries, shame, pride, vanity ... hate. And we make rational theories of various kinds such as philosophical, religious, political, scientific or mystical theories, all founded on non-rational premises that we accept a priori to our emotions, to justify what we do under them when we doubt the legitimacy of what we do. Only the doings done in loving, that is, the doings that we do without prejudices, expectations or demands, so that we, ourselves and others, arise as legitimate others in coexistence with us, these doings happen spontaneously, without requiring any theory to justify them. We biologically loving human beings are surprised when we witness the negation of love and ask: "Why did that person do that?" Love as the fundament of our ethical concerns and our ethical behaviour in our concern for the kinds of worlds that we generate in our living has no rational fundament. Indeed, love does not require any theoretical justification outside being itself as an aspect of our biological living as human molecular autopoietic systems.

Final reflections

I now wish to present some final reflections on our responsibility in the different kinds of worlds that we generate in the realization of our living as human molecular autopoietic beings. Because our actual living as human molecular autopoietic systems constitutes in fact the domain of fundamental relativity, the worlds that we generate are not in themselves independent of us, they are us living our living. Thus, the world *humanness* is us living our living as languaging reflective bipedal primates; the world *biosphere* is us living our living and our feelings about all the domains of living that arise in the constitution of the ecological organism-niche unity that we integrate; the world *science* is us living our living explaining and acting our living and the worlds that we live with the operational coherences of the realization of our living as molecular autopoietic beings; the world *technology* is us living, acting and operating in the extrapolation of the operational-relational coherences of the locality that we happen to inhabit at any moment with manipulative purposes, in the intention of securing a result; the world of social responsibility is us living and acting our living ethically in the desire of continuously generating an anthroposphere that realizes and conserves a human coexistence in mutual respect and ecological harmony with the biosphere that we generate in our living; ... Yes, the world that we have found that we live as the domain of fundamental relativity is us living it at the same time that we are aware that we live it. Yes, we find ourselves living the domain of fundamental relativity when we become conscious that we do so. And we are now conscious and aware that this is occurring precisely now; consciousness and awareness that makes us totally responsible for the worlds that we generate.

I think that is a wonderful thing: we do not create the worlds that we live, but they arise with our living and are in fact us as we live them. We feel that, for rational tranquillity, we need some external supporting something, but we cannot say anything about it that is not imagined from the operational-relational coherences of what we do in our living,

so that whatever we imagine belongs to what we do in our living. The fundamental question is not about what is, but about what is knowing, and the answer is that knowing is adequate doing (or adequate behaviour) in the living of the worlds that we bring forth as we live them.

In these circumstances the ethical question becomes whether we human beings like the worlds that we are living, and the answer that we may give ourselves will appear as the humanity that we want to have: what kind of human being do we want to continuously become? This is why and how it is that we are responsible for the cosmos that we live as we generate it in our living. All of us have been born as loving beings that trust implicitly in that they will be received in a loving world. Let us conserve a world of love with our children so that they may become serious, happy and responsible democratic loving adults; it is easy, you are being loving with me, as you have listened to me with attention and respect. So, I thank you very much.

APPENNDIX

Reflective remarks on our existence

Domains of existence

The observer is a human being operating in his or her niche with regard to his or her observing as he or she realizes his or her living in the ecological organism-niche unity that it integrates. Everything that the observer may say about living systems as such applies to him or her. The domains of the doings of living beings in general, and of human beings in particular, are the domains in which they exist in the ecological organism-niche of the observer as he or she observes them, as I show in Fig. 2. drawing 1). That figure depicts an abstraction of the organism operating as a closed totality, which is where everything that it does occurs in the aloneness of the internal dance of the realization of its molecular autopoiesis: this I shall call the domain of physiology. No doubt the observer can see the organism operating in an operational-relational domain that is the ecological organism-niche unity in which it exists, as shown in drawing 2), and this I shall call the domain of its behaviour. Furthermore, the observer can also see that an other organism may operate/exist in relation to the one that he or she is considering as part of its ecological niche, doing things together as shown in drawing 3), I shall call this the domain of coordination of feelings and doings. The observer can also see that in the historical flow of the domain of coordinations of doings, the two or more organisms that participate may transform together and constitute some different kinds of larger entities, some of which I may call symbiotic systems, families, communities or biospheres according to the way they operate as elements of each other's niche. And among these there are some whose recursive encounters and interactions become consensual coordinations of consensual coordinations of feelings, doings and emotions giving rise to the manner generating the kind of living together in a common ecological organism-niche unity that constitute living in languaging and conversations, as is the case with us human beings. What is interesting in all this is that, although everything happens in the aloneness of the realization of the molecular autopoiesis, and although the inner feelings of the living systems (living beings) in their different domains of existence are of necessity different, we can only speak properly of the inner feelings of those that, like us, happen to live as languaging beings and can talk and reflect about

what they feel. And this is so much so that we have invented different practices to attend to the different inner feelings that we live (experience) in the different circumstances of our doings, alone or with others. Thus, we speak of what we feel to be an external world in which we feel that we act and which we want to describe and explain, as well as of what we feel to be our internal world in which we also want to act or investigate in order to understand and explain or expand. Indeed, we like to feel and describe our different feelings in the different domains of existence in which we find ourselves living.

The worlds that we live

Although everything we do occurs through the realization of our living as molecular autopoietic systems, we live the worlds that we generate in the different domains of existence in which we observe ourselves to exist according to the different feelings that we feel as we find ourselves in them. And as we live in this way, we expect as we operate in them or describe them, that all satisfy the operational-relational coherences of what we do in them as molecular autopoietic systems, and we find that they do so. And we also find that we can abstract from our operation in the different worlds, which we generate, the different configurations of operational-relational coherences that at every instant define the operational-relational matrix in which we find ourselves, and which we can use to compute the transformation of our living so that we can live in them. Naturally, this is possible because everything we live as a process in our living occurs in the domain of the operational-relational coherences defined by our operation in the ecological organism-niche unity in which we exist as organisms as we realize our living as molecular autopoietic beings, regardless of the domain of feelings that we may be living. Furthermore, this is possible as an actual act of abstraction of the configurations of operational-relational coherences of what we do because the nervous system operates by abstracting (distinguishing) configurations of relations of activities in itself and in the sensory-effector correlations in our sensory and effector surfaces as organisms living in the ecological organism-niche that we integrate, whatever the domain of feelings we may be living.

All that we live, we live as valid in the moment that we live it

All that we live occurs in the flow of the continuous coherent changes of our structure and the structure of the ecological organism-niche unity that we integrate while we live valid all that we live in the continuously changing present of our living (Fig. 3). And we live all that we live feeling that the different changing worlds that we live are at every moment all that there is in the cosmos of the continuous present that we live, including the reflections and explanations that we make, alone or with others, about what occurs in our living.

Moreover, all this occurs as a historical recursive process in which the different worlds that we live arise as independent forms of the continuous changing present in which we exist, and which we may live alternatively as independent domains in the realization of our living. But sometimes those independent processes intersect in the flow of the realization of our living in the present, and incongruities appear that we treat as expression of the complexity of what we do or of the processes that we are dealing with, as if the complexity that we encounter were an intrinsic feature of what we do or of the processes themselves. Yet, the complexities that we may ascribe to the nature of what we do in the continuously changing present of the realization of our living, are not aspects of our doings or of the processes that we deal with, they belong to our

bewilderment about not understanding what we do, and not seeing that what we need is an historical explanation of the origin of the different things that we do or think. That is, the complexity that we ascribe to the present we live when we do not understand its origin disappears when, in our reflections on what we do, we realize that our present is always the continuous result of the dynamic architecture of the epigenesis of the ecological organism-niche unity that we integrate. Thus, if we do not propose to ourselves an acceptable historical explanation of what happens to us in our present resorting to what we do in the domain of the operational-relational coherences of the realization of our molecular autopoiesis, we are perplexed and remain confused. And in our perplexity we may think that we need mysterious causal relations to account for the present we are living because we confuse historical correlations with logical local relations, an attitude that dissolves in the light of what we see if we look at the processes of the dynamic architecture of our epigenesis and discover that what we have treated as local logical relations are indeed historical correlations. Therefore, the processes that take place in the domain of existence in which our molecular autopoiesis occurs are not complex in themselves. They are simple in the spontaneity of the structural architectural coherence of the historical present of their happening. The notion of complexity expresses our difficulty to abstract and see the coherences of the present we may be living without seeing and understanding the history that gave origin to it in a succession of spontaneous transformations of some initial condition. In the realization of our living as living beings, we do not need to understand the network of processes occurring in the operational relational domain in which our molecular autopoiesis takes place; the fact that we live as valid whatever we live in the moment that we live as every living being is enough. Yet, as reflective human beings we want to understand what we want or do not want what we say that we want. Indeed, perhaps our most fundamental question as human beings is about whether there are universal (transcendental) basic conditions that may tell us how we should behave in relation to each other in the different worlds that we generate with our living. We want to choose, we want to be autonomous, we want to be responsible of what we do, ... or do we want to control the cosmos in which we find ourselves living?

Origin of novelty

What is existence? When we speak of existence, we speak of something having presence in the flow of our living, either through our sensory encounters or through some process of computation that we have performed which shows how that presence can be lived or evoked through what we could accomplish in our doings in one or another of the several worlds that we generate in the realization of our living as molecular autopoietic beings.

When we reflect on what we do or distinguish, we perform a recursion in the flow of our doings and distinctions, and something new appears that could not have been deduced from what we were doing or distinguishing before. Recursions occur continuously in the flow of the processes that we generate alone and with others as well as in the spontaneous dynamics of the domain of processes in which our molecular autopoiesis occurs. As I said, whenever this occurs, an operational-relational domain arises that is intrinsically new.

The same happens in a collection of elements when some configuration of relations begins to be conserved and a space is open for everything else to change around the configuration of relations being conserved. On each occasion that this occurs in the contingencies of the encounters of the processes of the cosmos that arise through our

living in the operational domain in which our molecular autopoiesis takes place, a new entity arises as an operational totality together with the operational-relational domain in which it occurs.

No entity is in itself, and all entities exist as discrete totalities only as long as the configuration of relations that constitute them and the operational-relational domain that makes their existence possible are conserved. So novelties are recursively arising continuously in the spontaneous multidimensional historical operational-relational domain in which we human beings exist as the molecular autopoietic systems that constitute the fundament for the arising of everything as we operate as the centre of fundamental operational referent for the arising of everything.

When Einstein first looked at the conservation of the configuration of operational coherences that permitted him to claim that two or more events were simultaneous, he found himself immersed in the understanding of *Special Relativity*; then, when Einstein looked at the conservation of the configuration of operational coherences of movement in a curve of space that gave rise to "gravity", he found himself immersed in the understanding of *General Relativity*. Now, when in the present we look at the conservation of the operational-relational configurations of the biological-cultural dynamics that constitute cognition in the form of daily life, science, philosophy and technology through the realization of our living as molecular autopoietic systems in the ecological organism-niche unity in which we exist as human beings, we find ourselves immersed in the understanding of *Fundamental Relativity*.

In fact, novelty is always arising as an expansion of our understanding of everything we do as human beings whenever we attend some configuration of processes that we chose to conserve in the domain in which we exist as molecular autopoietic systems.

In the cultural moment that we live and that emphasizes innovation, what do we want to conserve?

Origin of truth

We live a cultural present in which much of what we do, we do it claiming that we want to know the Truth. Such an attitude is valid when we think that there is a transcendental domain of reality that is accessible to anyone who cares to search for it, and in which all is intrinsically valid and, therefore, truthful. As I have shown, that is not the case, or if it were so, we do not have access to it, and thinking about it is a fantasy proper to our being molecular autopoietic living systems. But as we need to be able to claim that what we say is valid when we want to do things together, we consciously or unconsciously use criteria of validation that state in an explicit manner the operational and relational conditions under which we claim that something is valid or true.

The understanding that I have shown to you of what I say when I speak of fundamental relativity permits us to speak of two kinds of conditions of validity: those that refer to the condition under which we accept that something is valid for us in our intimacy, and which we usually call beliefs; and the conditions under which we claim that something is publicly valid by describing the operations that any person should do, specifying the circumstances under which they should be performed, to obtain some particular result, and which we call criteria of validation.

Under these circumstances, something is true if it satisfies the criterion of validation under which someone claims it to be true. The interesting thing is that since the worlds that we live arise with our living them in the realization of our molecular autopoiesis, it is not truth as a relational value that guides us in the worlds that we generate in our living. It is our desires, it is what we want that determines the course of our living, and

the criteria of validation participate in the generation of the operational coherence of the processes through which we realize our desires.

And God, where is she/he?

I wish to answer this question at the very end of this conference, after we understand our humanness through understanding our biological-cultural living in the depth of our knowing that we are the origin of all that we live as human beings being the centre of *fundamental relativity*.

God appears in our life as a need for a transcendental explanation of our existence that is not satisfied by our occasional spontaneous experiences of expansion of our feelings of unity with all that we see and imagine that surrounds us, and that we call spiritual experiences. As such God appears in our imagination as intrinsically different from us and necessarily not accessible to our description, or even to our conception. Yet, she/he has represented and represents in the history of our humanness the source of the fundamental harmony of all existence as it appears in the spontaneous blossoming of a flower or the flight of a bird, a harmony that we desire to live in our lives. But where is God?

According to all that I have said, God is where we live her/him, and has the presence that she/he has as she/he appears in our living. The yogi Yogananda says in his autobiography: "If you think that God is near, God is near, if you think that God is far away, God is far away."

Where do we want her/him to be?