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Consciousness in the Neurosciences

Summary:

In this interview Francisco Varela traces the history of the development of consciousness studies and discusses the developments in contemporary cognitive neurosciences that have allowed consciousness to become an object of scientific study. From the experimental side, advances in non-invasive brain-imaging techniques make possible original research on neural correlates during cognitive tasks. But a non-reductionist science of cognition must take into account not only the brain, but also the fact that experience happens in the entire organism (embodiment), that itself is situated or “coupled” with the world. The notions of emergence and reciprocal causality are keys for conceptualizing this embodied, situated subject of experience. Finally, phenomenological reduction is seen as a necessary partner in scientific research, providing “first-person” accounts of experience that are correlated to the “third-person”, or experimental data, which constitutes the neurophenomenology research program.

Sergio Benvenuto – Could you outline the present situation of the debate in the neurosciences on the theme of consciousness?

Francisco Varela – The study of consciousness as an object of scientific study is connected to the cognitive neurosciences, as they are called today. This theme, repressed like a neurotic illness, has returned as the repressed does; it was repressed a second time and has now come back again. There are periods in which it is completely put aside and others in which it gives rise to a genuine infatuation. At the beginning of the 20th century the investigation of consciousness was a passion in Europe, above all in Germany, but also in America with William James. Psychology, which at that time was the equivalent of the neurosciences, was essentially interested in the problem of consciousness. But what today is called the *first person method* was also then in vogue: the phenomenological access, direct and introspective, to the contents of one’s own experience.

Between 1890 and circa 1930-40, however, interest in the scientific study of consciousness, was for various reasons eclipsed. When, following the Second World War, European science was blocked and then resumed in the United States, precisely there in the United States there was the inverse cycle: the total repression of the theme. It was the period of Skinnerian behaviorism, when the only object of science was behavior. And so behaviorism—according to which the scientific study of the mind could have as its object only the external manifestation of behavior (movement, perception, the intensity of perception, etc.)—dominated for a long period not only in psychology, but also in the study of neuronal systems. Behaviorism represented a sort of dogma which dominated scientific circles in the United States and exercised an influence also in Europe. Finally, in the sixties and the early seventies, what we today retrospectively call the cognitive revolution began.

The cognitive revolution consists in saying that the purely behaviorist approach seems insufficient to account for all that one observes in the life of animals and humans, and that one has to make the hypothesis—which is cognitivist—that somewhere internal structures exist, contents which are specific to the life of the mind, mental processes which cannot be reduced to mere behavior, such as memory, planning,

association, and so on. Thus, from the beginning of the seventies up to now, there was a return to the contents of the mind through the notion of “cognition”. From the term “cognition”—which became central in the seventies and is still very important today—the cognitive sciences take their name. In the latter, elements from psychology, linguistics, and indeed the neurosciences, concur in the creation of a discipline which tries to study cognitive contents as such. There are many different schools and tendencies: one approach considers cognition as a computational system, as computational modules, while another more dynamic approach is called connectionism.

When I started working as a researcher in the seventies, the study of cognition was at the center of interest, while consciousness was still something mystical, appertaining to philosophers, rather than scientific. It was not until the beginning of the nineties that, in this manic-depressive cycle of the history of science, suddenly the idea gained ground that one could learn many things about cognition: how an idea of movement comes into being, how a memory is constructed, how emotions work, how the modules of the cognitive life of an animal or a human being are articulated. And finally something appeared which is in very close relation with the life of man: consciousness, the experience as lived. A new wave was suddenly born: the so-called *science of consciousness*. All of a sudden it became acceptable, and indeed opportune, to talk of consciousness, to ask what might be the cognitive apparatus that makes the existence of a lived experience and a phenomenal [*phénoménal*] world possible.

Of course one is always speaking of animals—some would say that consciousness is only found in man, while others would say it is also present in the higher primates. But in every case, under certain conditions, the cognitive apparatus, about which we now know many things, allows the apparition of this phenomenon, unique in the universe, which is to have a lived experience—Nor, to use the expression of American philosopher Thomas Nagel, [author of a famous article: “What is it like to be a bat?” (1974)], to be able to ask “what does it mean to be someone?”, and by implication “what does it mean to have an experience?” In this new fad or fashion of consciousness there is a fascination with mystery, and the hardest nut to crack in the study of consciousness does not consist in explaining a certain cognitive phenomenon, capacity or ability which might be considered difficult, but which is essentially open to scientific research. Rather what allows us to say that there is an emergence of consciousness? What is consciousness? This problem opens a whole series of heated, at times violent, philosophical discussions. For example in April 2000 I was invited to a big conference at the University of Tucson in Arizona, on the theme “Towards a science of consciousness”. Five-thousand people took part and all the philosophical options were brought together in a wide-ranging debate.

Benvenuto – What are the dominant hypotheses on the theme of consciousness today?

Varela – Even though the panorama is truly vast, it is not difficult to imagine the dominant hypotheses, because a somewhat reductionistic tendency still prevails among scientists—and I do not say this in a derogatory or pejorative sense—which consists in an attempt to bring the problem of consciousness back to a purely materialistic explanation. This is the program of the cognitive neurosciences. I speak of *cognitive neurosciences* because it is not only a case of the study of the brain, as in the neurosciences, but rather of new methods of cerebral mapping [*imagerie*]. These new methods for studying the living brain directly in humans, in a non-invasive manner, permit us to ask cognitive questions without touching the person, while at the same time to have access to the neuronal correlates. Thus, for the first time, we can put a man in the functional MRI machine, tell him, “shut your eyes and imagine your dog walking past you on the road”, simultaneously record the cerebral activity, and then see the results. Then we can compare this with those obtained by showing him a photograph of the dog, so we see the difference between imagining and perceiving. Such questions, which until a few years ago could not even be asked in that they regard the imagination and mental life, are very close to lived experience.

Which technologies have made possible the recent changes in experimentation?

One generally thinks of the aforementioned methods of cerebral mapping [*imagerie*], which can consider the brain as a single unit and use different types of signals, making it possible to re-construct the image of what is happening within the brain, without touching the person. There are essentially three methods.

The newest is *Magnetic Resonance Imaging* (MRI), and in particular functional MRI, which allows us to

measure the changes in haemodynamic alimentionation of the different parts of the brain which become activated when a task is performed. In this way the images that the public has already been able to see are obtained: a brain with little patches of color, like a Christmas tree, which correspond for example to the act of lifting an arm or having a memory. These images were unthinkable until a few years ago.

The second method, *Positron Emission Tomography* (PET) resembles a scanner, such as those used for clinical analysis, producing slightly heavier images than in MRI. By injecting a substance which liberates radioactive particles (an emission of positrons), it builds up an image of the brain's activity.

Last but not least, the study of the brain's surface activity today uses apparatuses for performing magneto-encephalograms, which makes it possible to measure the minute magnetic fields found on the surface of the head. These extremely precise magnetic fields, by means of mathematical elaboration of the data, supply a dynamic image of cerebral processes which can thus be observed from a new angle.

The combination of these three systems—magneto-encephalography, PET [Positron Emission Tomography] and MRI [Magnetic Resonance Imaging]—constitute the techniques which make the new cerebral mapping possible. And long-used techniques are still practiced, such as recording the cells by inserting electrodes within the skull—classical neuroscience uses techniques from neurochemistry and neuro-anatomy. The new techniques belong to the cognitive neurosciences, precisely because they make it possible to ask genuinely cognitive questions on an extremely concrete neurological, or to be more precise neuronal, substratum.

The distance between those who work in the field of psychology and those who work in the field of neurosciences narrowed to the point of becoming almost non-existent. Work is being done simultaneously in both fields, which accounts for a sort of renaissance in studies on consciousness and for the central role of the neurosciences in the debates on consciousness. The voices with the widest audience—mine together with many others—are those of people carrying out laboratory research on the basis of the cognitive neurosciences, which seem to supply the most direct evidence for connecting our experience and consciousness to their biological and cerebral substratum.

The problem is that most of my scientist colleagues tend towards the reductionistic program and are spurred on by the desire and hope to discover the circuits or the location of consciousness—to use the key-words, *the Neuronal Correlates of Consciousness* (NCC). For example, Sir Francis Crick, a Nobel prize winner who together with Watson discovered the structure of DNA, has dedicated his life to the study of the brain, and is convinced of having identified the circuits responsible for the phenomena of consciousness. His book, *The Mysterious Hypothesis*, declares: we have discovered that we, with our life and our experience, are nothing but a bunch of neurons. This is a decidedly reductionistic idea. I am not drawing a caricature, but am simply presenting the words and the choices of a scientist of great standing. And so the notion of a neuronal correlate of consciousness is truly the essential element in question. What do the neuronal correlates of consciousness consist of? Have they been found, or are they yet to be found? Is it possible or impossible? This is the fundamental debate.

Can you present your personal—anti-reductionist—position in this debate?

There is a reductionistic tendency in accordance with which the notion of NCC truly occupies the majority of debates, but some of us—evidently I am not alone, even though we are still a minority—think that the question posed in these terms has no solution, for the simple reason that lived experience as such is in principle logically and empirically non-reducible to a neuronal function. This is what is called *the hard problem of consciousness*. That which belongs to the realm of lived experience has a stature or a nature that cannot be explained in terms of the neuronal system. A correlate can be found, but this correlate absolutely does not change the fact that the phenomenal aspect remains a phenomenal apparition, a phenomenal accession to my consciousness. It is thus necessary to present the discussion in different terms.

One should bear in mind that the debate on consciousness started off and developed mostly in the United States, where the philosophy of the dominant science—*philosophy of mind*—is a philosophy of an analytic type, which is essentially concerned with giving good definitions for categories and objects, while my philosophical background is that of the phenomenological tradition. In this tradition the point of departure is the nature of lived experience and the material explanation of the world, the explanation of the relations between the phenomenal element and the world. Every attempt to reduce or dissolve the phenomenal

element into the empirical would be a task destined to fail. What is the alternative? The alternative is in a certain sense evident—not banal—as long as one reflects adequately upon it long enough. Basically when I say that consciousness is lived experience I am not speaking of something that exists only in my head. I cannot begin looking for consciousness by starting from a section of cerebral circuitry. Consciousness does not belong, so to speak, to a group of neurons: it belongs to an organism, to a human being, to an action that one is living. That really isn't the same thing. I wish to say that one cannot have a notion of consciousness and the manner in which it emerges if one does not take into consideration the fact that the phenomenon of consciousness appears in an organism and is connected to at least three permanent cycles of activity. In the first place consciousness is permanently connected to the organism. One all too easily forgets that the brain is not a bundle of neurons dissected in a laboratory but exists within an organism which is essentially carrying on its own auto-regulation, its nutrition and self-preservation, which feels hunger and thirst and needs social relations. At the basis of everything that regards the integrity of organisms, there is finally the sensation of existence, the sensation of being here and of having a body which has a certain integrity. In one essential aspect consciousness is part of the permanent activity of organismic vitality which, operating on the basis of the sensation of existing, is continually permeated, interwoven, by emotions, sentiments, needs, desires.

In the second place consciousness is evidently “coupled” directly with the world, or interacting with it through the whole sensorial-motor surface. I have the consciousness of this glass in the sense that when I see the glass I say: “I have the consciousness of this glass”. But the glass is not an image in my head of which I have to become conscious from within. In good neuroscience it has been discovered that the glass is inseparable from the act of manipulating it. The action and the perception constitute a unity and the world does not exist, apart from within this cycle, within this permanent coupling. There is an interaction with the world, which only emerges thanks to this coupling, which is a permanent source of sense perception. It is a very evident thing, constituted from the study of children, the neuro-physiology of the motor and sensorial cortex, and so on. When I speak of the contents of consciousness, and I say that I can see a glass, a friend's face, or the sky, I do not suddenly start to speak of neuronal circuitry which picks up information from the world and makes it a correlate of consciousness. Instead I am speaking of something which is necessarily de-centered [*excentré*], which is not in the brain, but in the cycle, between the external and the internal, which only exists within action and within the cycle, in the same way in which the sensation of existence lives in the cycle between the neuronal apparatus and the body.

But there is also a third dimension, valid above all for man and the superior primates: the fact of being structurally conceived for having relations with others, with individuals of the same species, of having an innate ability which is empathy, putting oneself in another's place, identifying oneself with the other. The relationship between the mother and child is nothing but a case of empathy. I am unable to separate—not only in infancy, but for the rest of my existence—the mental life, the life of consciousness, the life of language or the life mediated by language, the whole cycle of the socially mediated empathic interaction, from that which I call consciousness. And so again all this does not happen within my head, but in a de-centered [*excentré*] way within the cycle.

The problem of the *neuronal correlate of consciousness* is badly presented because consciousness is not in the head. Basically, consciousness is an emergence which requires the existence of these three phenomena or cycles: with the body, with the world and with others. The phenomena of consciousness can exist only within the cycle, in the de-centralization that it involves. In all this the brain evidently has a central role, because it is the enabling *condition*, the condition that makes everything else possible.

Thus consciousness is not a segment of cerebral circuits, but belongs to an organism which is incessantly involved in the different cycles, and thus is an eminently distributed phenomenon which does not only reside in the head. As regards the brain, it is essential because it contains the conditions which make it possible for this to happen. The amazing thing about the brain is that it permits, for example, the sensory-motor co-ordination of the whole interaction, the hormonal regulation which ensures the maintenance of corporeal integrity, and so on, but the notion of *neuronal correlates of consciousness* as such is, to use the words of Alfred Norton Whitehead, “an inopportune concretization”. If one adopts this move, many important facts are simultaneously excluded. And so mine is an anti-reductionist position.

Can you explain more how the concept of emergence in the neurosciences works?

Basically the notion of emergence is an absolutely central idea for me. Without this notion one remains trapped in fact happens in most cases in a dualistic viewpoint of the *body/mind* type, without ever being able to understand how an activity of both a cognitive and a conscious type can be connected to a material base, without being reduced to a material influence; basically one will not be able to understand how a non-reductionist approach to the material basis of consciousness is possible.

Emergence is a notion which, from the start of the 20th century, developed in physics. It derives from the observation of the transitions of phase or transitions of state, or how one passes from a local level to a global level. I could give a banal example. In the atmosphere numerous particles of air and water are circulating, and suddenly, due to a phenomenon of self-organization—this is the key word—they become a tornado, an object that apparently does not have a true existence, because it exists only in the relations of its molecular components. Nevertheless its existence is proved by the fact that it destroys everything it meets in its way, and so it is a curious object.

The notion of emergence has had many theoretical developments, and in biology one finds that the phenomena of emergence are absolutely fundamental, because they allow us to pass from a lower level to a higher level, to the emergence of a new ontological level. That which was just a mass of cells suddenly becomes an organism, a group of individuals can become a social group, a group of molecules can become a cell. Thus the notion of emergence is essentially the notion that in nature there are a series of processes, governed by local rules with small local interactions that, when put in appropriate conditions, lead to the creation of a new level to which one must recognize a specific identity.

Here the word *identity* is important. When one speaks of a certain cognitive identity, one thinks for example of a dog which decides whether to go right or left, which has a certain temperament or a certain behavior, an individual life. One can easily say that this is the mental, cognitive life of the dog: he prefers, chooses, remembers, etc. In the vision of the neurosciences, the origin of all this lies in the series of interactions, and so in his perceptions-actions, in the coupling with the world which makes the transitory level of an aggregate emerge from a sort of assemblage of all the particular modules which are perception as such, the action as such, etc. etc.—putting them together in a co-ordinated unit which is supposed to be the cognitive life of the dog. There is a jump here.

For us human beings it is the same. Our identity as individuals is of a totally peculiar nature. On the one hand one can say that it exists. They say, “Hello, Francisco”, and I can reply and have relations with other people. And so there is a sort of interface, a coupling with the world, which gives the impression of a certain level of identity and existence. But at the same time this process is of such a nature that actually, as in all emergent processes, I cannot localize this identity, I cannot say that it is to be found here rather than there; its existence does not have a *locus*, a spatio-temporal position.

It is difficult to understand that we are dealing with a purely relational identity, and so the tendency to search for the neuronal correlates of consciousness springs up, to attempt to find them in neuron 25 or in circuit 27. But it is not possible, because we are dealing with a relational identity that only exists as a relational *pattern* without any substantial and material existence. The thought that everything that exists must have a substantial and material existence is the most ancient way of thinking in Western tradition, and it is very difficult to change.

It is an atomistic way of thinking.

Atomism is a way of seeing things which lies at the roots of materialistic philosophy. Physicalism, which is more widespread, supposes that the only form of existence is material. The interesting fact is that in scientific and non-philosophical circles, first of all in science and only later in philosophy, the notion of emergence was discovered. This is the truly important scientific revolution: that one can even implant equations on these transitions from one level to another; from the local to the global, from which it follows that *de facto* life is something in excess, a way of being in nature which is not substantial but is, so to speak, virtual—efficacious but virtual.

Would you then accept being defined as holistic, in contraposition to atomistic materialism?

The term holistic is outdated because it dates back to the period of opposition between the idea that a strong reductionist program could be created, and a notion which was philosophically motivated by the need to react against that program. I do not practice holism, I try to practice good science. A great quantity of natural processes—the development and functioning of the brain, the organization of the immune system, the organization of ecological systems—cannot be understood if one does not take into consideration the dialectic between the two levels, which holism has never really understood. And so the term holism is not appropriate. By emergence I mean something central to contemporary scientific research, even if many people have still not understood its importance. What is so inspired about the notion of emergence is that if, on the one hand, a group of neurons in interaction with the world leads to the origin of cognitive activity, on the other hand, as in all processes of natural emergence, once the emergence of a new identity has taken place, that identity has some effects, some repercussions [it is the *descendent causality*] on the local components. This means that the concept of emergence allows us to think for the first time of mental causality. The mental is no longer an epi-phenomenon, a sort of smoke that comes out of the brain. On the contrary, it can be scientifically, logically and even mathematically demonstrated that the existence, the emergence, of a mental state of consciousness can have a direct action on the local components, change the states of emission of a holo-transmitter, change the states of synaptic interaction between neurons and so on. The fact that there is a genuine coming and going between that which emerges and the bases which make the emergence possible impels us to make a completely different description of the place of consciousness and cognition in general in the universe, not as a fluctuating level, but as an intrinsic part of nature, as an intrinsic part of the dynamics of the natural world. This is what helps us to advance: not the perennial repetition of a dualism that does not lead anywhere, without having to resort to reductionism, and without consciousness losing its phenomenal status, its own status.

And yet the idea that the essential task of any science is to make predictions, to predict phenomena, is very widespread. Do you agree with this? Do you think that your approach, for example, which is based on the notion of emergence and other non-reductionistic concepts, can really increase the predictive capacities of the neurosciences? If not, could this be an objection to your approach? Could one sustain that what you say is more plausible and realistic than the reductionist approach, but that perhaps it does not definitively contain a greater capacity for prediction than the reductionist approach?

This is a legitimate and often asked question. When the paradigm of the physical sciences dominated, in every conference there was always someone who said: “I have a good theory to predict the trajectory of electrons”. He was then asked to predict the trajectory of an electron and show that he knew the exact position in any given moment: an excellent method founded on anticipation and prediction. Physics, with Einstein and the theory of relativity, exploited it in an inspired way.

But be careful! It would be a purely physicalist reflex to think that this is the only method according to which science proceeds. Because in the field of the natural sciences apart from physics, for example in the science of the living, this is not what interests us. Suppose that I say “I have a perfect understanding of how this dog walks”. What interest is there in predicting in which instant he will move his right leg in the instant $t_0 + t$? It appears absolutely banal. What proves that my theory is good? The fact that I can reconstruct a dog which can move. There are two approaches in science: the predictive approach and that which we can be called the constructive approach. To be right you must be able to construct a device which can move like the dog. That is something much more convincing than anticipating the movement of the dog’s right leg.

But even constructing something means predicting that it will work in a certain given way. It is still a case of prediction, although it is active and not passive.

Anyway, the constructive method is the way in which science proceeds today. Thus one proceeds in the interface area between the neurosciences and artificial intelligence. Artificial intelligence is to a great extent the constructive proof of the theories which originated in the field of the neurosciences: for example, making robots capable of finding their way around in a world. The scientists who construct this type of automata are

inspired by biology, but the proof that the theory is good is that the robot walks. It is less interesting to predict the exact point in which it will make a certain movement, as much as that the qualitative capacity to carry it out emerges and becomes manifest. And so the proof of emergence is the construction, not the prediction.

But can one really construct a living thing, since a robot is not a living thing? Can one really reconstruct living organisms starting from the inorganic?

Yes, absolutely. We are very near, precisely because theories of the emergence of the cell exist. In this field there have been absolutely extraordinary recent results, such as the production of synthetic cells, different from historical cells because they use different components. For the same reason one can try to reproduce the whole development of a multi-cellular animal on the basis of disaggregated cells. If one has a good theory of emergence, of the form of an embryo, one can apply it. Thus in this type of proof there is absolutely no less rigor than in the old type of proof, typical of physics. It is therefore really a case of a change of field.

So is constructivism a confirmation of the strictest determinism? Or on the contrary does it make room, as I seemed to understand at the beginning of your discourse, for a sort of indeterminism of the event?

Everything depends on what one means by “determinism”. If “determinism” means that one knows the fundamental laws of the universe which allow us to understand how certain phenomena—among which we can place consciousness—emerge, then effectively from this point of view it is a deterministic approach. But it is not deterministic in the Laplacian sense of the term, because prediction is not interesting or even possible. They are complex phenomena: most emergent phenomena are defined as “non linear”, because they work on bases that do not permit prediction; they are of a chaotic nature. In these cases prediction as such is not interesting. I cannot calculate what a given individual will think in a following instant, precisely because this is part of the law of emergence of his thought.

You said you were influenced by phenomenology and you referred to a sort of coming and going between phenomenology and neurosciences. Can you better illustrate for us your intellectual history?

Evidently when one is interested in these problems of cognition and consciousness, one is also always sustained by a philosophical interest. I was early on strongly influenced by continental philosophy and to a large degree precisely by phenomenology.

Is this why you chose to work in France, rather than in the United States or in England?

I later went to the United States to complete my studies, and after working there for many years I realized that the continental, European orientation, that I had learned in my youth, was not the only one. I had to be initiated into a completely different approach that the Americans call *philosophy of mind*, a philosophy of an analytical type, characterized by a completely different spirit, antagonistic to continental philosophy. It took some time before I got used to that type of thought and, as time passed, I realized that that type of philosophy was not at all suitable for me, even though at that time it was dominant in the field of the cognitive sciences. The great philosophers who dominated the scene, Daniel Dennett, John Searle, came from the tradition of the *philosophy of mind*, which did not say much to me, and in any case I had decided to leave the United States for Europe.

When I settled in Europe, there was at that moment a genuine renaissance in phenomenology, which for years had been considered by the public as a philosophy which consisted above all in commenting on dusty specialized texts that nobody ever read. But in reality phenomenology is above all—starting from Husserl, who founded it—a way of working which is completely open to new data and new orientations. And so a whole new generation adopted phenomenology as a working instrument, for the study of cognitive questions in science. Why? Because it was necessary.

Let me give an example. We were talking earlier about the conceptualization of perception, of the objects of the world. Until a short time ago there was a representational idea of perception. The glass is there and within myself I have an image of it. The fundamental idea that we now have of this experience is that the act and the perception are inseparable. We have now discovered, moreover, that Husserl and Merleau-Ponty examined these questions at length and that they dealt in depth with the theme of the inseparability of perception and action. If one reads, for example, Husserl's extraordinary book called *Ding und Raum* (*Object and space*), in which he describes in great detail the way in which the kinetics of the body go towards constituting an object, one can see the incredible observational precision which is typical of phenomenology, through which it shows things which today are compared—and they are in perfect agreement—with the results of the neurosciences.

One cannot say the same of the analytic philosophers, whose work is based on purely external analysis and who have never entered into a direct comparison with empirical data. There is an increasing tendency towards making phenomenology a source of reflection, all the more so when one is interested in the description of the structures of consciousness—which is the basic central element of phenomenology. With the method of phenomenological reduction (which has nothing to do with physicalistic reductionism), observation and analysis, one can locate the central element in the structures of human experience. Today, with the boom of the sciences of consciousness there is a very powerful return to the “first person” method, which was once called introspective; a method which can take into consideration the data of personal lived experience, to carry an experiment ahead. Phenomenology presents itself to whoever has this kind of interest as a natural partner of his/her research in the laboratory.

One should nevertheless remember that Husserl also wrote *The Crisis of the European Sciences*, in which he denounces scientific objectivity. Do you think that the European sciences can overcome the crisis denounced by Husserl?

Husserl is a multiform thinker and some of his works have only been published recently. There is still a great quantity of unpublished writings, and if one reads a book like *The Analysis of the Passive Synthesis*, one is able to avoid taking Husserl's pessimism literally when one reads *The Crisis*. I am not a scholar of Husserl. Husserl is a man who said many inspired things, as well as many less interesting things. The important thing is his style, the impulse that he impressed upon research to which we are now contributing. And so one cannot agree or disagree with certain things he said, because he said so many things that there is space for one or another attitude. One should put aside the idea that philosophers are monolithic. And philosophers like Husserl or Merleau-Ponty should give us inspiration for our work.

Do you believe that there is a renaissance of phenomenology also in the sciences? If so, does this renaissance take place in any specific scientific domain or is it in some way diffused?

This renewal of phenomenology—both in the United States and in Europe—has an interface with science, and concerns many fields, but in particular the cognitive sciences and the study of consciousness. Books have been published recently, conferences and seminars have been held here in Paris, there is already a considerable quantity of literature. Phenomenology also has an interface with mathematics and mathematical physics. But its penetration into the universe of the cognitive sciences is very interesting and it is changing the data in the debate. In American conferences one even hears people say that scientists with a phenomenological background should be invited. People are starting to understand that the philosophy of the mind is not the only option, and so its hegemony has been shaken.

Are there living phenomenologists you feel close to? So far you have only mentioned Husserl and Merleau-Ponty, who are the classics. Could you mention someone more recent, more at the *cutting edge*?

There are many well-known people, such as Edouard Marbach in Switzerland, of a Husserlian background. He is interested in the interface and has written a very interesting book, *Mental Representations*, on this theme. On another line, and of another school, is the American Hubert Dreyfus, well known for his criticism,

from a phenomenological point of view, of the cognitive sciences. Among the younger generation in the United States there is Shaun Gallagher, a scholar in his thirties, with a good background both as a phenomenologist and as an analytical philosopher, who knows the field of empirical research very well. A young Canadian philosopher with whom I work a lot, Evan Thompson, also has a double background as a phenomenologist and analytical philosopher, but he also knows the problems of science. Finally, there is a very competent young Danish philosopher, Dan Zahavi. It is a long list, as you can see...

Translated by Tristram Bruce

Notes:

1) Conversation held in Paris, on January 29, 2001, at the LENA Laboratory in the Hospital of the Pitié-Salpêtrière.