Chapter 1

(Experimental) Proceedings

A Radio Encounter between Assiduous Listeners of "Cultural" Broadcasts, a Biologist, and a Philosopher

The topic proposed by the radio program was how "science" can help people resolve their problems. More precisely, "since we can no longer believe in religion and ideologies have failed us, only science remains as a source of truth in which we can believe. Only from it can we (and therefore must) learn how to live. Given its brilliant successes, including sending men to the moon and discovering the secrets of life, it is abnormal that it does not help us more in knowing how to live and be happy. It is the duty of men of science like yourselves to tell us what we must do and how to do it."

The biologist and philosopher, *without prior consultation between them*, responded to this demand made by the show's audience and hosts with a refusal, which they justified by explaining that it was a case of mistaken identity and in particular an error about the goal of scientific research, which is not the enunciation of moral law. This encountered an indignant reaction on the part of the hosts, who felt that their two guests were not playing by the rules of the game. The latter took turns defending themselves vigorously, while the demand itself became ever more pressing and even aggressive, culminating in the assertion: "Your attitude is that of traitors who are dodging your obligations to society. Society has allowed you the great privilege of engaging in a profession you like, which gives you many benefits, intellectual satisfaction, the opportunity to travel, etc.

So you owe it something, and especially to those of us who do not enjoy such privileges. Your side of the bargain is to tell us what we must do."

This dialogue of the deaf became a traumatic experience when the hosts, to confound the two unfair players, played tapes made by other scientists who were willing to play by the rules. These proved to be self-confident speeches about how the thermodynamics of irreversible phenomena can teach us to organize our life in society and about the moral philosophy that can be "scientifically" deduced from the most recent theories of neurophysiology. The two allies, outflanked, found themselves obliged to condemn these colleagues whom they esteemed for their achievements in science and to demonstrate how the latter had exceeded their field of competence. But of course the battle was lost even before it was begun and merely reinforced the idea that "these two individuals were a bad choice. They are not representative of the community of good and responsible scientists upon whom we can and must count. Fortunately there are others. We'll repeat this program later, we hope with a better choice of guests."

November 1978: The President and the Biologists

On November 28, 1978, the president of France appointed three renowned French biologists to "study the consequences that the discoveries of modern biology are apt to entail for the organization and functioning of society, to make note of those biotechnology applications that offer the greatest benefit for human progress and happiness, and to propose appropriate means for applying them."[1]

After a year of work these scientists, assisted by a team of specialists, produced a report entitled *The Life Sciences and Society*, which received fairly broad coverage in the print and broadcast media. This full and fair report highlighted the "hot spots" of contemporary biological research, the great advances made in recent years, and the enigmas still to be solved. The last section, "Interactions between Biology and Society," and the conclusions of the report expressed the consensus of the vast majority of prudent practicing biologists, who are aware of the limits on what may reasonably be expected of their discipline in domains such as politics, society, and ethics, which go considerably beyond it. The problem is not the report's content—not surprising, given the identity of its authors—but its very existence, or rather the solemnity surrounding its commissioning and submission. Of the three studies that President Giscard asked the biologists to undertake (see above), only the last two were really within their domain of competence: to make a list of the most useful applications of biotechnology and to propose appropriate means for applying them, with all the limits

inherent in a prognostic study that attempts to peer into the future. Restricted to these two questions, the study would have served to direct research policy in biology and have been rather more in the province of a minister of research than of the president of France. Analogous studies could have been carried out with regard to the research orientation of other disciplines in the physical and social sciences. But the peculiar nature of this report involved the first item in its authors' commission: "study the consequences...for the organization and functioning of society." Evidently this is what interests not only those responsible for research policy, but also those responsible for the conduct of public affairs in general, and justifies the presidential commission and its attendant solemnity. At the same time, the commission constitutes an astonishing short-circuiting of all the intermediate echelons and, above all, of other important persons whose domains of competence are no less relevant for the study requested: sociologists, philosophers, moralists, artists. Once again, the report's contents make a felicitous attempt to make amends for this approach. We read that

> sooner or later, however, the development of the [life] sciences will have to attach itself more closely to the future of society, its hopes, its ethics.... What is needed above all is profound and protracted reflection by a group comprising not only scientists and politicians but also individuals with other fields of expertise. This is where social planning and ethical imperatives join forces.[2]

As its concluding lines point out: "Contrary to what one would sometimes have us believe, it is not on the basis of biology that a particular idea of man can be shaped. On the contrary, it is on the basis of a particular idea of man that biology can be used in the service of the latter."

But what concerns us here above all is the reason for the commission. Why should the president of France feel a need to ask biologists—and only biologists—to help prepare a forward-looking study of the organization and functioning of society? The answer was provided by one of the president's spokespersons, who told the press, several days after the publication of the report, that the president's future decisions would be the appropriate ones because they would be instructed by Science. This explains the underlying motivation for the commission and also why the science called upon was biology, which fascinates the general public more than any other because of its real or supposed relations with (scientific) Truth, on the one hand, and (individual and collective) Life, on the other. The president wanted the same thing as the public, who expect to find in scientific dis-

course a guarantee of the truth and correctness of social and political, and even ethical, behavior. The contents of the report, which to some extent warn against this expectation, do not counterbalance its very existence as a response to, and justification of, the commission.

Since then, France has a new president and new political constellation. The new and more democratic approach to the problems of scientific research culminated in a national colloquium on research and technology in 1982; efforts have been made to modernize scientific research and increase its budgets, despite corporate and trade-union obstacles. There is a contradiction between the desire for competitive and aggressive research that would succeed on the technological and industrial plane and "put an end to the crisis," on the one hand, and aspirations for a convivial and fraternal society that permits the flourishing of the greatest number. But the same implicit postulate is held by all: scientific progress is the only sure and indisputable value that satisfies the consensus of (almost) everyone when it is a question of choosing the right directions in the social and political arenas.

Versailles, 1974

This was an international colloquium of molecular and cellular biologists, immunologists, and neurophysiologists, who met with physicists, biophysicists, and mathematicians to discuss some of the questions posed by the study of intercellular communications. There were passionate presentations about the experimental strategies that had led, at the end of long and patient labor, to the elucidation of molecular structures that serve as substrates for exchanges of information between cells or between the organism and some of its specialized cells, or for the collective behavior of a cluster of cells in the course of differentiation. There were equally passionate presentations of formal models, mathematical or otherwise, kinetic, thermodynamic, or simply logical, that provide a coherent representation of the cooperative mechanisms through which the collective behavior of cells is produced from molecular and membranal interactions. At that point a physicist mounted the podium to deliver his invited paper. This was Brian Josephson, a specialist in superconductivity who had discovered the celebrated effect that bears his name and won him the Nobel Prize.

First surprise: he wrote on the blackboard a list of reference works meant for anyone who wanted to delve more deeply into the subject of his talk, and it ran from the *Bhagavad Gita* to the teachings of Maharishi. After that he spoke of the results of experiments in transcendental meditation, which triggered various astonished reactions in the audience. The lecture

continued with a description of the state of consciousness obtained through such meditation. Then he "explained" this state of consciousness by invoking the possibility that brain cells could attain the same state as that of matter at a temperature close to absolute zero, precisely in those conditions where superconductivity effects are observed. Conductivity without resistance, which characterizes these effects, would thus also be found in cerebral structures, under the effect of meditation! There he had gone too far: a molecular biologist, who had earlier described the detailed experiments that had led to the discovery of the structure of hemoglobin, literally exploded. "Nothing forces us," he said furiously to the physicist, "to listen to your wild speculations. You are not respecting the implicit conventions of a scientific conference. Each of us is reporting on the results of reproducible experiments that in principle anyone can repeat in the laboratory. This is not the place for you to talk about the states of your soul." To which the physicist retorted calmly: "What I am talking about is the result of reproducible experiments performed with the aid of a technique that anyone can apply in order to verify this reproducibility!" The session broke up in the uproar that ensued.

California, 1967–1968

The hippy movement was born, developed, and grew on the wings of hallucinogenic trips, stimulated chiefly by LSD. In addition to its psychedelic effects on sense perception and other modified states of consciousness, LSD always produces neurovegetative effects that may be perceived as pleasant or not, depending on context, such as sweating, palpitations, vasodilatation and vasoconstriction, fatigue, and so forth. These phenomena are felt as waves of heat flowing through the body, which a physician has no trouble recognizing and attributing naturally to these neurovegetative effects. For the hippies, however, it was a flux of cosmic energy whose overflow quite naturally accompanies the expansion of perception that characterizes a trip, just as LSD makes one sensitive to the vibrations that everybody produces in his or her surroundings, good and bad "vibes," which can produce amorous ecstasies or rage reactions. They could have only a dialogue of the deaf, or almost so, with the physician-physicist who, armed with his physiological and physical interpretations, insisted that energy and vibrations have nothing to do with the "real" effects of LSD. No communication is possible because the (reproducible!) effect of LSD is precisely to transform the perception of reality so that the hallucination, *although perceived as different* from normal perception, is accompanied by a sense of reality that *nothing* distinguishes from

the normal sense of reality associated with real objects outside a "trip." At the same time, though, it is most difficult for scientists looking on from the sidelines to admit that the hippies' is a correct usage of the notions of energy and vibration, even after themselves experiencing this transformed perception of reality. And should this experience persuade the scientists that these notions express it better than the more prosaic explanation that invokes neurovegetative and sympathetic-antipathetic effects, what remains of their science and their critical mind after they have completed these adventures? And how will they react to the scholarly dissertations of their psychoanalyst colleagues about psychic energy, its circulation, its investments and disinvestments, transposing all the properties of physical energy, including the law of its conservation, when no known form of physical energy (heat, mechanical, electrical, chemical) is involved? This would be a third "scientific"(?) use of the word *energy,* one that has little in common with the other two—and not counting our normal daily use of the word ("he got up full of energy today").

Cordoba, 1979—Science and Consciousness: Two Views of the Universe[3]

Scientists, some of them well known, met with individuals nurtured by the great religious traditions of East and West, of Islam and Israel. There was also a large contingent of psychoanalysts (most of them Jungians), who, by virtue of the peculiar status of the discipline, found themselves in a third camp of knowledge and practice. The aim of the meeting was to resume the dialogue, which had been interrupted several centuries earlier, between the search for rational explanations of the world and its latest achievements in twentieth-century science, on the one hand, and the teachings of mystical traditions about the hidden aspects of reality, on the other.

Center stage was occupied by quantum mechanics (or, in more general terms, subatomic physics) and the cosmic consciousness. This time the same Nobel laureate physicist whose talk was interrupted at Versailles was able to develop at leisure his theories that interpret the experiences of transcendental meditation in terms of physics, and physics in terms of states of consciousness. This represented a new approach to physics; the guarantee of its scientific nature resided in the fact that the knowledge on which it is based and which derives from mystical and spiritual traditions "is based on experiences with well-defined, controlled states of consciousness."[4] Of course this approach is grounded in the abrogation of the subject-object distinction, a distinction that is only a harmful moment in the Western

mode of thought and of which, happily, the Eastern traditions are free. Moreover, Western science is ready to go beyond this distinction and thereby to link up with the mystical traditions, thanks to the recognition of the role of the observer in quantum mechanics and of the role of the computation of probabilities in descriptions of reality! Finally, biology, especially that which focuses on the nervous system, must not lag behind physics in furthering this fusion and its discoveries, providing the keys to a unified articulation of matter-life-consciousness.

These themes recur again and again, in different garbs. throughout the 500 pages of the conference proceedings. After physics through the lens of the Vedic tradition of India and the teachings of the Maharishi Mahesh Yogi, it was the turn of the Tao of physics, which explains how a new vision of reality is imposed by the fact that "concepts like matter, object, space, time, cause and effect, etc., are totally different in atomic and subatomic physics from the corresponding classical ideas.... A new world view is now emerging which turns out to be closely related to the views of mystics, especially to those of the mystical traditions of the Far East (Hinduism, Buddhism, Taoism)."[5] The misleading vision of reality from which we emerge is of the world as an inert machine composed of isolated entities, separated from consciousness and the soul by a Cartesian dualism cast in the form of Newtonian mechanics, the model that dominated all scientific thought from the second half of the seventeenth century until the end of the last century. Opposed to this are both the Eastern vision of an "organic," "dynamic," "alive" nature and that suggested by modern physics, a "cosmic web" composed of patterns where "ultimate reality" is no longer that of the "isolated basic building blocks" but a "dynamic web of interrelated events."[6]

Statements by the physicist Werner Heisenberg, juxtaposed with others by a Tibetan Buddhist, Lama Govinda, and others, persuade us that quantum physics speaks an "Oriental" language.

Another interpretation of the role of probabilities, it too invoking the role of the observer in quantum mechanics, makes it possible to cross another barrier on the road toward the unification of cosmos, matter, and consciousness: that which has hitherto prevented us from considering the parapsychological phenomena of psychokinesis and precognition to be scientific![7] With the aid of information theory, we are to understand that *observer* refers not to the operation of observation and measurement[8] but rather to the direct influence of the observer's consciousness (or of the cosmos through the observer?): "The fundamental problem thus raised has not yet been fully penetrated; it certainly goes to the root of the relation between cosmos and consciousness."[9]

The author of this paper, O. Costa de Beauregard, also relies on certain equations in subatomic physics, in which elementary particles can

"climb back up" the timeline, and on the quantum-mechanics problem of nonseparability. He concludes:

> The associated past-future and knowledge-organization symmetries mean (as can be shown in terms of formulae) that the observer is also an actor, and therefore that what parapsychologists call "psychokinesis" must logically be accepted. "Precognition" too must be logically accepted if the future exists in actuality, and if convergent waves are not to be discounted.
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> The indirect transmission of messages to Elsewhere along Feynman lines implies "telepathy" and "telekinesis"—and *this* is what frightened Einstein, twice mentioning "telepathy" in this connection in 1949, Schrödinger, using the word "magic" in 1935, and de Broglie, seeing in 1956 an "incompatibility with our conventional ideas of space and time."
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> In the Vedas, it is often stated that separability is an illusion, depending on our pragmatic approach; that higher states of consciousness involve a knowledge of the past, the future, and the Elsewhere, and also the possession of paranormal powers.[10]

This same thesis is then developed in greater detail by another physicist,[11] based on an analysis and interpretation of the problem of measurement in quantum mechanics, which goes under the name of the collapse of the wave function.

In general, at this Cordoba colloquium we encounter a series of convergent interpretations all of which lead, *grosso modo*, to the same conclusions: the unity of matter and spirit in a cosmic spiritualism that describes the universe in terms of consciousness, will, and interior life and that coincides on this point with the teachings of the mystical traditions (both major and minor).

Initial Questions

Having had the opportunity to study and practice one of these traditions from the inside, I cannot avoid asking two types of questions. *How* is this second-order fusion effected—a fusion of scientific and mystical traditions that have long been separated (at least explicitly), of materialism and spiritualism, suddenly converging in a shared recognition of the cosmic fusion of matter and spirit? To what extent is this fusion confusion, both with and without the play on words? Second, *why*? Why is there this con-

vergence, this unanimity in the quest for unity, to the point that the representatives of religious and spiritualist traditions sometimes seem to have been outbid by the physicists, when it is clear that physics by itself, if it raises problems like any developing science, in no way imposes such interpretations?

The shifts of meaning that accompany spiritualist interpretations of information theory, of the Einstein-Podolsky-Rosen inseparability paradox, of Heisenberg's uncertainty principle, of the effects of observation and measurement in quantum mechanics, have been frequently analyzed and condemned.[12] But basing a "model for psychokinesis" on the quantum-mechanics measurement problem known as the collapse of the wave function certainly represents a zenith in this genre, and one that we ought to analyze in detail.

Cosmic Consciousness and the Collapse of the Wave Function

In the formalism of quantum mechanics, an elementary particle such as an electron and its behavior are described by a mathematical function (the wave function) that can be used to represent the probability of the presence of a given quantity of energy in a region of space. In interference fringe experiments, which can be conducted with these particles, just as with light waves, by making them pass through the experimental equivalent of two adjacent slits, the interference results from the fact that the wave function of each particle is spread out in space over a region that includes both slits. In certain conditions, the probabilities of its passing through one or the other slit are equal. A beam composed of a large number of electrons will be statistically distributed between the slits, reproducing conditions that are in every way similar to those produced by light waves and giving rise to the phenomenon of interference fringes. But the situation changes when each electron is considered individually as a particle localized in space: then it can pass only through one slit or the other, not through both of them at the same time. In fact, the passage of individual electrons can be detected; the measurement apparatus of the detector indicates only a single position (one slit or the other) for each electron. It is as if, prior to detection by the apparatus, each electron occupies a position spread out in space over both slits, just like a light wave, and in keeping with its wave function; but the mere fact of detecting its emergence from one of the slits reduces its wave function to the single region of space that covers only that slit. What is more, the usual idea that the detection and

measurement apparatus introduces a perturbation of the electron *is not enough to account for this reduction*. The formula applied (Schrödinger's equation) can describe this perturbation in the form of a modified wave function that takes the quantum state of the measurement device into account. Because of the mathematical properties involved (the linear superposition of two or more different wave functions), the modified wave function still covers both slits. No matter what physical system of observation and measurement is employed, including the human eye and brain, if it obeys the physical laws described by quantum mechanics it will not modify the wave function of the observed electron so that it no longer covers both slits. Observation of the measurement device, however, indicates a single position of the needle on a dial, for example, indicating the electron's passage through only one slit. The usual conclusion is to say that the mere fact of observing the particle entails the collapse of the wave function; that is, its reduction to a single region of space. This reduction cannot be explained by the physical properties of the measurement device, because all agree that these are fully described by Schrödinger's equation.

This difficulty has led a number of leading physicists (including E. Wigner and John von Neumann) to conclude that in this case observation calls into play a system that does not obey the laws of quantum mechanics. Because these laws are supposed to apply to all material reality, they deduce that the effect of observation on the wave function is that of some nonmaterial reality, which can be only the mind of the observer. For a physicist this "explanation" raises at least as many problems as it solves, because in this context the mind of the observer is defined only operationally and negatively: whatever it is, in a human being, that registers the unique position of the needle on the dial of the measuring device does not obey the Schrödinger equation! From there to attributing to this "act of consciousness" the properties that introspection, certain psychological theories, and spiritualist traditions attribute to it is a considerable leap, which those who offer an idealist interpretation of quantum physics do not hesitate to make.

In fact, as we shall see,[13] this interpretation is by no means imposed by quantum mechanics itself. It is rather the result of a certain epistemological approach to physics, which is *often held even by physicists who think they are opposed to it*, including several who were present, in the minority, at the Cordoba conference. This approach involves confounding reality as it is *described* by physical science with what is called "physical reality," in the sense of the reality of matter itself.

As we shall see later, many of these physicists hold this attitude, which actually rests on a simple, if not simplistic, materialist metaphysics; the failure of this metaphysics leads some of them to its equally simplistic

idealist antithesis. But to go from there to using this idealism as a "model of psychokinesis," a physical foundation for paranormal powers that modify matter by direct action of mind and will, remains quite a distance, and so lighthearted a crossing of that gulf leaves one flabbergasted. Yet it all seems to be perfectly logical. This is why it is important to try to take apart the mechanisms of these "deductions": because the mind of the observer acts on the wave function and reduces it during the observation, there "must" be continuity between human consciousness and matter, a continuity that can be formalized using information theory, with the shift of meaning we have already spoken of, namely, from the computation of probabilities used in an objective description of the sequence of events to the perception of information by a human mind with its psychological and even spiritual dimensions. The result is a "theorizing" about the possibility that human consciousness and will can deform and modify macroscopic samples of matter by direct action at a distance, thereby giving a "physical explanation" to the phenomena that are regularly reported—and no less regularly disputed—under the rubric of psychokinesis.

Confusions of Levels and Disciplines

We are dealing here with one of the most common characteristics of these shifts of meaning in the use of scientific language, to which we shall return at greater length: a change in the level of organization (of observation, of relevance, etc.) with a jump over an entire series of intermediate levels. If the solution of the problem of the reduction of the wave function really implied the possibility of action at a distance by human consciousness on matter, it ought to be manifested first of all on the level of the wave functions of elementary particles. In other words, the simplest psychokinetic experiment to conduct, as well as the most persuasive, would be to force all the electrons in a beam to pass through a single slit and thereby suppress the interference phenomenon. Such experiments have never been reported. Those that are spoken of imply an effect at quite a different level of organization of matter, macroscopic samples whose form or structure is supposed to have been modified; and that is quite a different world than that of the wave functions of elementary particles reduced during observation of their passage one by one through a defined region of space.

The nonphysical (idealist but not necessarily spiritualist) interpretation of this reduction by the observer's mind is initially merely a negative interpretation that

1. Takes note of the fact that the formalism of the Schrödinger equation is insufficient to describe what takes place during observation;

2. Supposes that this formalism exhaustively describes physical reality; what is more, that its structure *is* the structure of physical reality and that everything outside it must be nonphysical. Note that this hypothesis is often shared by materialist physicists who, as a result, agree to consider the problem of measurement in quantum mechanics as one posed by physical reality and not only as a shortcoming of the theory.[14]

At first—with von Neumann, for example—all of this was merely the statement of a theoretical difficulty and was expressed only by posing a provocative question (along the lines of "if so, everything happens as if" the mind of the observer reduces the wave function) to underscore the difficulty. But this prepared the ground for the most extreme spiritualist interpretations, in which the mind of the observer that acts on the measurement is no longer a negation or a shortcoming of the formula, but is thoroughly confounded with the subjective experience[15] that we have of our own existence, thought, imagination, and memory—in short, of everything that constitutes our inner life. Nothing, except perhaps the misuse of the word *mind* or *consciousness,* justifies such a leap. Even if one allows the interpretation of the measurement as the reduction of the wave function by the observer's mind, this effect ought to be produced during any observation, by any observer, even a nonphysicist who has not the slightest knowledge of quantum mechanics and wave functions. To put it another way, it should be an effect of observers' minds even unknowingly—without their being conscious of it. It would thus be the unconsciousness of their mind or their unconscious mind at work. This is why, in such a case, paranormal powers would be—paranormal: they would be observed only in particular circumstances. But then who would prevent quantum physicists, who are themselves aware of it, from exercising their mind on the wave function so as to modify at will, by action at a distance on the measurement devices, the results of their experiments? The answer is that for such physicists, as we have seen, and unlike what the spiritualists would make of it, the mind in question has no operational content. No one knows how it works on matter at a distance. It is merely a word invoked when others, such as *God* or *Nature*, are unable to plug up a hole in the theory. In other words, we lack either a theory of consciousness formulated at the same level of organization as that of subatomic phenomena (but then it would no longer involve human consciousness, a mental phenomenon, but would be a theory of observation and measurement in subatomic physics), or a theory of mind

at the level of human mental process and language, in interaction with other levels of reality and observation, and *with no discontinuity* down to the level of subatomic physics. But such a theory would be a theory of knowledge, which can be the result only of metascientific philosophical reflection on the conditions in which scientific knowledge is produced.

The preceding also suggests a third way; namely, invoking precepts that can play the role of this theory of consciousness but that are derived from different traditions of knowledge, foreign and even antithetical in their approach to the scientific knowledge that has evolved in the West. Without standing sentry over scientific knowledge, it is important to reflect on the implications of such an exercise and on the conditions in which these perilous transpositions can lead to fruitful intuitions or to delirious platitudes.

The incidents reported above include an element—exemplary and farcical when renowned scientists are involved, as in the second and fourth cases—of confusing levels and of brutal analogical transpositions lacking the perspective of distance. Languages and theories elaborated in a particular discipline and meaningful as explanations of the phenomena described at the level of observation characteristic of that discipline are transposed unchanged to other levels, corresponding to other disciplines, where these languages and theories no longer have the same meaning: the superconductivity of solid-state physics used to "explain" the nature of the modified states of consciousness produced by a technique of meditation; or, moving in the opposite direction, the mind of the observer, perhaps confounded with a cosmic consciousness, used to "explain" the paradoxes of quantum mechanics in subatomic physics. For most scientific researchers the outrageous nature of these transpositions is so evident and their improper character has been so frequently denounced that one is astonished that they crop up with such regularity under the pen and in the mouths of renowned scientists who have demonstrated their talent and originality in undeniably scientific labors. Most often the problem arises only because of the social standing of the researchers: the same theses would have no impact were they put forward by undergraduates or by nonscientists. They would be immediately labeled, in the worst case, as formidable errors to be rejected out of hand without even being examined and, in the best case, as surrealist diversions displaying more or less talent.

Yet the phenomenon, by virtue of its repetition, demands that we take a look. Why are these transpositions, so obviously delirious, continually rehashed by those whom one has the right to expect would be least susceptible to them? And why are they so often found in a mystical context, whether that of ancient traditions or of a mysticism of science lending out its vocabulary while surreptitiously or overtly denaturing it? What is the

function of these curious and multiform dialogues between Western science and traditional beliefs whose participants, long before Cordoba, include Newton with alchemy and Oppenheimer with Hinduism—not to mention the long line of scientists-philosophers-mystics, Jews, Christians, and Moslems, from the talmudic sages through Teilhard de Chardin, by way of Maimonides, Avicenna, the kabbalists, and the Sufis? One cannot merely dismiss this phenomenon as a delirium without consequences. Not only are its social consequences far from negligible; the refusal to discuss it in the name of some rational purity that might be compromised cannot be justified even from the point of view of rational critical reflection on the practice of science.

It is consequently out of the question to fall back on the classical scientific position in which pure science, the result of triumphant rationalism, does not tolerate the proximity of any other mode of thought or apprehension of reality; in which *poetic* and *philosophical* (not to mention *mystical,* of course) are pejoratives that designate second-order, metaphorical discourse. This position found its supreme expression in the program of logical positivism, the full-fledged battle plan of an ideology in which the natural sciences, in association with formal logic, are supposed to provide the exclusive model of liberating thought and knowledge, sheltering humanity from the errors of irrationalism and their extensions in modern totalitarian mythologies. The intention was praiseworthy, but in practice it wound up as a sterile ideology that subjected the totality of mankind's lived experiences to a one-dimensional law, that of the formal, the technical (the techno-logical), and the operative, eventually denounced by Marcuse and Habermas, among others. In parallel, the pretension of logical positivism to account for the practice of scientific discovery in its social, psychological, and historical contexts had ever greater difficulty justifying itself in the face of the critiques of Kuhn, Lakatos, Quine, and Feyerabend; while the works of Wittgenstein and Popper appeared like worms in the apple of this scientific ideology, gnawing away at the very core of logical positivism, with which they shared the adventure while rejecting its axioms.[16]

On the other hand, modern epistemology, with its devastating critique of the rules that were supposed to guarantee access to truth and eliminate error, cannot justify this type of confusion, of which we have noted several examples; even if Feyerabend[17] hoped to counterbalance the new scientific dogmatisms by recommending that Darwinian theory and the biblical account of creation be taught in the schools in parallel! For all that the vanity of the quests for any criterion of demarcation between what is and is not scientifically permissible is quite evident in this critique, the result is not that everything is all one and the same. The fact that there is something of the irrational in real science, that it participates against scientists' will in

their thought processes, which they would devote entirely to the realization of a program for the rational comprehension of the universe, and that in this regard the handbooks that recount a history of science in which reason always triumphs over darkness and error are telling tales, does not imply that nothing distinguishes the rational from the irrational, light from darkness (even if these distinctions are not identical). Finally, it does not imply that the distinct is not more distinct and thereby different from confusion.

Thus it is not a case of throwing back into the arms of obscurantism every attempt at dialogue between traditional lores and scientific knowledge (which also has a traditional aspect) and even less of banning a priori any attempt at analogical transposition from one scientific discipline to another. But neither is it possible to accept everything and confound everything. Even if we understand that the purity of the crystal of rationality is an optical illusion, that it is totally immersed in the irrational and in error, which even serves it as a point of departure, the converse is not true: not every error or hallucination bears within itself the germ of greater rationality. Hence it is important to try to know when one is still in those seas that are simultaneously fertile and dangerous, where fantasy and rationality can mate, and when one has been carried away by a current that confuses everything. On the other hand, the dialogue between scientific knowledge and traditional knowledge can take—and has done so effectively—quite different forms, as a function of the goal pursued and the social and ideological context in which it is conducted. Here too it is important to be able to distinguish a questioning and curious encounter from a welter of mutually reinforcing dogmas about "ultimate reality."

Our purpose here is not to seek new rules of demarcation but to understand what takes place—among both the general public and scientists—when these differences are abolished. More precisely, we want to analyze the mischief provoked by the sort of confusion we have seen several examples of, again, not in order to pontificate new rules aimed at eliminating this mischief but in order to try to pave a road that is no less necessary for all that it is naturally tortuous and muddy. There is a narrow path between outright rejection of everything that is not the light of reason, as the West has represented itself for the past few centuries, and acceptance on principle of all confusions, on the pretext that "anything goes."[18] There is a narrow path between—again—the crystal of ready-made academic knowledge, already established and petrified in "light having finally triumphed over the darkness of the past," and the smoke of free associations where the inadequacies of those petrifications are used to justify obscurantist regressions. But this path also connects the crystal, whose rigorous and luminous structure is a bedrock and guarantee of existence, and smoke, whose unpredictable swirls alone can lead to the still unknown.[19]

To reach that point, we must recognize that knowledge activities are games, in which the serious is not serious and only humor can be warranted as serious. Then the rule of rules, when we are dealing with the game of games and not with the search for some phantom "ultimate reality," consists of letting them play, letting them meet through differences and contrasts rather than through similarities.

Notes

1. Letter from President Valéry Giscard d'Estaing to F. Gros, F. Jacob, and P. Royer, published with the report, *Sciences de la vie et Société* (Paris: Le Seuil, 1979).

2. Ibid., p. 280.

3. *Science and Consciousness: Two Views of the Universe, Edited Proceedings of the France-Culture and Radio-France Colloquium, Cordoba, Spain,* ed. Michel Cazenave, trans. A. Hall and E. Callander (Oxford: Pergamon Press, 1984). Unlike the previous cases, this is a case of indirect experience from press reports and published proceedings.

4. Brian D. Josephson, "Conscious Experience and Its Place in Physics," in ibid., p. 9.

5. Fritjof Capra, "The Tao of Physics," in ibid., p. 21.

6. Ibid., pp. 22–28.

7. Olivier Costa de Beauregard, "Cosmos and Consciousness" in ibid., p. 43.

8. Addressing this question of the relations between entropy and information in a 1972 work on information theory (Henri Atlan, *L'Organisation biologique et la théorie de l'information* [Paris: Hermann, 1972]), I indicated the reservations elicited by this abusive psychologizing and subjectivist interpretation of the probabilistic theory of information, even when it was expressed in a more moderate fashion and in the context of otherwise extremely interesting work. Nothing allows us to speak of information in the common meaning of the term, and even less of mental process or consciousness, when we are dealing with probabilistic measurements of information, where what is measured is only the a priori uncertainty regarding the interaction between a mensurable event and a measuring device, leaving aside any meaning and any other effect that this event might have on human mental processes. Here the thesis is even more radical.

9. Costa de Beauregard, "Cosmos and Consciousness," p. 35.

10. Ibid., pp. 43f.

11. Richard Mattuck, "A Quantum Mechanical Theory of the Interaction between Consciousness and Matter," in ibid., pp. 49–65.

12. See, for example, J.-M. Lévy-Leblond on the "uncertainty relations" he suggests calling "inequalities": *Bulletin of the Society of Physics* (Paris), supplement to no. 14 (April–May 1973), p. 15. See also J.-M. Lévy-Leblond and F. Balibar, *Quantique (rudiments)*, (Paris: Interéditions, 1984), Chapter 3; on the EPR paradox, M. Mugur Shāchter, "Réflexion sur le problème de la localité," in *Actes du colloque du centenaire d'Einstein* (Paris: Centre national de la recherche scientifique, 1980), pp. 249–264; on information theory, Atlan, *L'Organisation biologique*, pp. 197–200.

13. See Chapter 6.

14. See Chapter 6 for a discussion of the attitude taken by F. Selleri, who in Cordoba represented the materialist physicist opposition.

15. Not only with subjective experience, moreover, but also as the object of diverse disciplines such as the branches of psychology (experimental, behavioral, analytic), linguistics, psycholinguistics, and psychosociology. This is why, quite naturally, those carrying on the dialogue with the spiritualist physicists at Cordoba included not only adherents of mystical traditions but also practitioners and theoreticians of psychology, here almost exclusively Jungian psychoanalysts. This role that psychoanalysis *can* play (but which it is not condemned to play, Jungian perhaps more so than Freudian, although the latter is not immune) as the cement in these fusions is clearly linked to the special position of this discipline, as thoroughly analyzed by Jacques Lacan, who located it between and alongside science, magic, and religion (J. Lacan, *Ecrits* [Paris: Le Seuil, 1966], Chapter 7). We shall return to this point in Chapter 5.

16. D. Lecourt, *L'Ordre et les jeux. Le positivisme logique en question* (Paris: Grasset, 1981).

17. Paul Feyerabend, *Against Method* (London: NLB, 1975).

18. Ibid.

19. See Henri Atlan, *Entre le cristal et la fumée* [Between crystal and smoke] (Paris: Le Seuil, 1979).