COMMITTEE III
Forms and Symbols: The Roots of Behavior

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THE ROOTS OF BEHAVIOR IN CONTEMPORY PHYSICS

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I. FORMS/SYMBOLS, FREE-WILL AND THE HUMAN BEHAVIOR

Forms and Symbols contitute the roots of the human behavior. But no behavior would grow out of these roots without the help of "free-will". Let us first explain what we mean with such an affirmation, and start with the precise meanings of the words Forms and Symbols.

1. Forms and Symbols

We call Forms the primitive images that our senses detect when we look at the outer world. They are these images in their primordial aspect, that is even before they are memorized by our Mind; and a fortiori before this Mind has given some significance to the considered Form. Philosophers generally make the distinction between sensation , which is the simple interaction of our senses with the outside world, and perception , which is the meaning that our Mind conveys to the product of our sensations, taking into account the present structure of our memory, including the "logic" used by

our Mind and the presence of our "free will". Forms are consequently what appears "at first sight" when our senses consider the outer world, our own body included. And, as we just noticed, Forms generate in our Mind the memorization, and later the interpretation, of these Forms.

Now the question is this: we said that memorization and meaning are operations that take place in our Mind, where "data" related to Forms are recorded and associated together in such a way as sensations become perceptions, Forms become memorized significant entities. Although we are still pretty ignorant of what are exactly these entities, we shall make the convention to call **Symbols** these mysterious memorized entities associated to Forms, which render these Forms significant. Symbols are consequently meanings associated to Forms.

The above definitions of Forms and Symbols imply that these two words in fact designate two complementary aspects of the same entity: Symbols designate the meaning of some Forms. Even if we do not presently have the direct sensation of the said Forms, these Forms have been "sensed" in the past.. Obviously, it would be impossible to generate any meaning, that is to say any Symbol, if we had had no sensation whatsoever, that is no communication between our Mind and the Forms of the outer world (if not only the Forms of our own body). On the other hand, nobody knows what is a given Form if this Form has not, at some time, be memorized (if only for an instant) by our own Mind; that is if this Form has not in some way be, at some time, associated to one or many Symbols. Therefore, we should correctly speak of Forms/Symbols, and not of Forms and Symbols separately. Forms/Symbols are complementary aspects of the same "unidуality", in the same way as are the corpuscular and wave aspects of any particle of Matter in Physics. Each corpuscle has got a wave aspect, as well as each wave refers to some elementary Matter. Similarly, Forms/Symbols are complementary aspects entering the representation of our Universe.

2. The roots of our behavior

Now, said we above, the Forms/Symbols are the roots of our behavior. Indeed, we get sensations of the outer world (we "sense" the world), at every second of our life; this sensation of this instant "cumulates" in our memory with previous perceptions that we got from the world, generating in our Mind a significant memorization of the world valid for

this instant. This means that, at each instant, we get a complete "landscape" of memorized Symbols, concentrating more or less on some particular regions of this landscape. How can we "concentrate" in this way on some special regions of this memorized symbolic landscape ? The answer is of importance: we concentrate on special regions of our memorized landscape because we possess **"free-will"**, that is the liberty to compare different regions of our memorized landscape (including the present situation of the outside world in our neighborhood); and we also have the liberty to act according to one of the possibilities authorized by the present states of our inner and outer worlds.

To summmarize, our behavior indeed takes its roots through a comparison of each instant between the Forms of our outer world (sensation of the outer world) and the complete landscape of Symbols of our inner world (significant perception recorded in our memory). This comparison generally yields an infinite choice of possible behaviors. There comes "free will", which consists of the choice of a unique actual behavior amidst that infinite set of possible behaviors. In other words, our behavior rests on three fundamental elements, which may be considered as the roots of our behavior: Forms of the outer world, Symbols of our personnal memory and this so mysterious thing called "free-will", or Liberty. However, it is clear that as long as we would not know a little better about "free-will", we would just be left without any real explanation concerning our behavior.

3. Of Men and...particles

Towards what sort of knowledge could we turn to learn something more about free-will ? Curiously enough, we plan to suggest here contemporary Physics as a possible "light" to get a better understanding of free will. After all, the particles of Matter have also "behaviors" of their own. And, from Quantum Mechanics, we also know that any individual particle, confronted to a given situation of its outer world, is offerd an infinite set of different possible behaviors, each behavior possessing a given probability to be actually adopted by the individual particle. This probability does not say what will be the actual behavior of the individual particle, which may as well choose to adopt the less probable behavior. This means that, apparently at least, the individual particle seems to possess for its own something which strangely recalls our own human "free-will": confronted to an infinite set of possible behaviors, the individual particle

chooses to adopt an inprevisible behavior (although this particular behavior belongs to the infinite set of possible behaviors authorized by physical laws for such a present situation of the outer world). To be true, this "imprevisibility" has for a long time been explained by the impossibility for the human observer to obtain a complete knowledge of the initial position and motion of this individual particle (incertainty relations of Heisenberg). But this interpretation has been recently chalenged by a new theory, called Complex Relativity, which concludes that significant memorized data might be associated to the structure of each individual particle, again reinforcing in this way the possible analogy between the roots of the behavior for man and mice (or rather particles !).

Is Physics going to help us to understand our own behavior, and more especially to understand "free will" ? This is what we would like to investigate in this paper.

II. COMPLEX RELATIVITY AND THE MODEL OF THE INDIVIDUAL PARTICLE OF MATTER.

Complex Relativity, which constitutes my own field of research in Physics, and that I have progressively been developping for the last twenty years, is an extension of Einstein's General Relativity. It assumes that our Universe should be represented as made of two complementary parts: a "visible" part called Real and a non-visible part called Imaginary . More precisely, if we consider the Universe as made up of Forms and their associated Symbols, we should say that Forms are the constituents of Real, while Symbols are the constituents of Imaginary. The most important result of Complex Relativity is the demonstration that each individual particle of Matter should be represented as possessing both these two complementary aspects of Real and Imaginary; each individual particle is made up of Forms, and also of significant Symbols. This means, in turn, that each individual particle has got "senses" to detect the Forms of its "outer world" (emission by the particle of the well-known probabilistic psi wave of Quantum Mechanics), and has also got a "significant memory" (inner world) in which it accumulates significant Symbols associated to the Forms perceived in the outer world. This significant memory is composed of a "spinorial" field, which can be mathmatically represented, and which is called the sigma field.

It is not possible to enter here into the details of this new

"model" of the individual particle of Matter <1>; to make it short, the discovery of a significant memory at the level of the individual particle of Matter means that each particle should be considered as possessing a psi wave to "sense" its outer world and a sigma field (personnal inner world) to significantly memorize Symbols associated to its "sensation" of this outer world. The result of the "coupling" between the psi wave and the sigma field is (for the particle) the knowledge of an infinite set of possible behaviors, taking into account both the sensations (psi wave) and the significant memory (sigma field) of the individual particle...exactly as does each individual human being.

A more careful study of the actual behavior of individual particles of Matter, in accordance with the theoretical and experimental investigations of Quantum Mechanics ("strict" non statistical probabilism, Copenhaguen' interpretation) shows that the actual behavior of the individual particle is not only the result of the psi-sigma field but also of a "choice" made by the particle at each instant of one behavior amidst the infinite set of possible behaviors which is offered by the psi-sigma structure of the particle at this instant. This, again, means that each particle behaves at each instant like a "living" being, sensing the outer world, making use of the symbolic memorized data of its inner world to consider the whole set of the possible behaviors, and finally calling for its own "free-will" to choose and actualize a precise behavior.

Physics was, since the beginning of the century, quite used to the presence of the psi wave, complementing the corpuscular aspect of each individual particle of Matter. But the sigma memorizing field is a "feature" which was totally unexpected, especially when we insist on the fact that this field represents a significant memory, that is a memory made of Symbols correlated together in such a way that each Symbol has got a meaning , a significance **for the particle** (and not for the human observer only, as previously assumed by Quantum Mechanics). Indeed, since Descartes we all were deeply impregnated by the idea that our Universe was parted into two categories of phenomena, which could roughly be described as Matter and Thought. And only human beings had the immense privilege to possess both Matter and Thought. But, for the rest of the Universe, we were confronted with objects made of Matter only . In recent times, this latter affirmation could eventually be discussed somewhat, and the possibility of animals possessing a certain (minor) form of Thought could be accepted as worth being the object of argumentation; but, as for the individual particles of Matter, meaning here this "pure" Matter submitted to the investigation of theoretical

and experimental Physics, it just looked as a "crank" preposterous idea that it might be represented as something doted of a property ressembling any kind of Thought. Well, that is however what Complex Relativity has demonstrated. This demonstration is not simply resting on mere "assumptions" (in that case this would not be a "demonstration"), but is given through quantitative mathematical solid arguments (calculation, using the model of the "minded" individual particle of Matter, of the correct values of all the 19 "constants" of Physics, which so far had only been "measured", but never "calculated" by a unified physical representation).

III. IS OUR OWN BEHAVIOR THE GLOBAL RESULT OF THE INDIVIDUAL BEHAVIORS OF THE PARTICLES COMPOSING OUR BODY ?

This is the "natural" question coming next, after Complex Relativity has shown that our body is made up of particles of Matter which "behave" using the same fundamental principles as we do: sense the outer world, compare the information to the data memorized and ordered in a personnal inner world, conclude to an infinite set of possible behaviors and finally choose a unique actual behavior in that set.

Indeed, the question was already meaningful even before the discovery of "mind" properties in particles of Matter, for those physicists (and they formed the majority) who thought, before Complex Relativity, that Mind was a simple "emergence" of the complexification of Matter. But Complex Relativity now shows that "complexification" takes place at the level of the individual particle of Matter, that the "emergence" of Mind starts with the simplest forms of material structures, that Thought is a complementary aspect of any elementary form of Matter. However, we are now speaking of complexification of the Symbols belonging to the individual particle: it is this symbolic complexification which, in turn, will give birth later to the complexification of the material structures, when individual particles "get together" to constitute "living" organisms.

The first idea, after we become conscious of this "generality" of the Mind properties in the Universe, could be to suspect that, in such conditions, our own behavior would be a kind of "statistical" behavior resulting from the physical and mind interactions of the individual particles of Matter composing our body. And I concluded myself in this way some few years

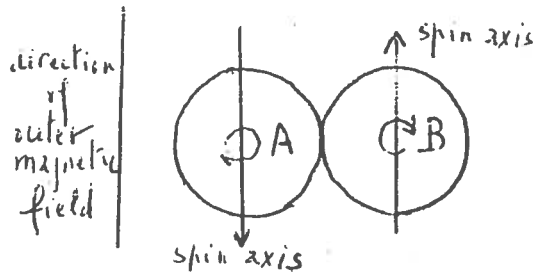
ago, as soon as I recognized the Mind properties of each individual particle of Matter. For such a case, we could say that our own human behavior is a kind of statistical behavior, as we observe for the social behavior of a large group of human individuals living close together in a community.

But, following a further study of the new Mind properties of the individual particle, it soon appeared that this interpretation for the roots of our own human behavior was wrong. All particles making up our body cooperate together as if they were forming one large particle with a multiplicity of "functions". Exactly as things would go in a large group of ants (antshill). This "cooperative" harmonious behavior of individual particles in any living body is the result of a special property of the individual particle of Matter, that has been recognized by Complex Relativity, and which is called **Union**. Let us briefly indicate what is Union.

IV- UNION AND THE COOPERATIVE BEHAVIORS OF INDIVIDUAL PARTICLES IN A BODY

1. The phenomenon of Union

Any particle of Matter can be represented as a tiny magnet, or very roughly as a microscopic sphere with a magnetic north pole and south pole. Physics say that each particle has got a "spin axis", which can be assimilated to a magnetic axis.



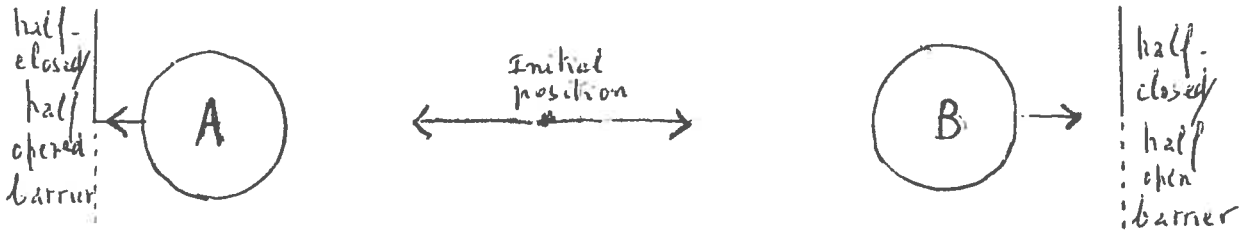
When two particles come close together and set themselves in a position where their magnetic spin axis are parallel but have opposite senses we say that their spin axis are antiparallel , or again that their total spin is zero. For reasons that will become clear below, Complex Relativity call Union of two particles A and B the phenomenon consisting of having the two particles close together with antiparallel spins. Such a

situation of A and B can be experimentally obtained by immmerging A and B into a magnetic field of sufficiently high amplitude, since the spins of each individual particle have for such conditions a strong tendency to become parallel (or antiparallel) to the common direction of the outer magnetic field.

For a pretty long time already Physics had observed that astonishing properties could follow after two particles had been in this way submitted to the phenomenon of Union.

2. The E-P-R paradox

One of those "astonishing" properties is called the Einstein-Podolsky-Rosen paradox (or E-P-R paradox), since its principle was originally proposed by these three physicists in the years 1930. In fact, Einstein proposed this experiment to demonstrate that the representation given by Quantum Mechanics was not "complete", that something was missing to completely explain the experimental observations (this complete representation obviously being the main objective of Physics). Let us schematize the E-P-R experiment as follows.



Two protons (the nucleus of the hydrogen atom) A and B are brought close together in a strong magnetic field, in order to obtain that their spin axis are antiparallel (and therefore respectively parallel and antiparalel to the direction of the outer magnetic field). We obtain in this way what Complex Relativity calls the Union of A and B.

Then A and B are separated, A moving for instance to the left direction, B moving towards the opposite right direction. After the two particles are sufficiently far away, so that they can no more "communicate" one with the other, and at the same instant, we interpose on their respective path a barrier allowing them to choose between two possible behaviors. For clarity and simplicity, we shall call the interposed object a "half-closed/ half-opend barrier", so that each particle is confronted to two possible behaviors: either crossing the

barrier, or stopping behind the barrier. According to the "orthodox" theory of Quantum Mechanics, A, as well as B, has got a fifty percent chance to cross the barrier (and consequently another fifty percent chance to stop behind the barrier); and, "evidently", what A does should have no influence on the behavior of B, since the two particles A and B have no possibility to communicate together.

Now, it is not what shows experimental observation. Physicists discover, at their great astonisment, that if A crosses the barrier then B does the same; and if A stops behind the barrier then B stops also. Since this surprising behavior of the particles has no support in Quantum Mechanics, that fact justifies the opinion of Einstein and his colleagues that Quantum Mechanics is not a complete representation of the phenomenon, that "something" is missing in the representation (although Einstein never precised what could be this "something").

To get out of this "paradox" the physicists have not hesitated to propose still more "paradoxical" interpretations, like a mysterious signal exchanged between A and B and propagating at a quasi-infinite velocity...in contradiction with the accepted limitation of the velocity of any signal to the speed of light (Einstein's Relativity). Also it was suggested that nothing was truly "separated" in the Universe, whatever the distance; or that "future" phenomena could interact with present phenomena.

The "less paradoxical" explanation was probably the one of Einstein himself: the E-P-R paradox demonstrates that there are probably "hidden parameters" which are not taken into account by the "orthodox" Quantum Mechanics; these hidden parameters would explain that the respective behaviors of the particles A and B are not the ones which were expected from Quantum Mechanics only. And also that the initial position of A and B "close together with antiparallel spins" must probably play an important role in the interpretation, since the behaviors of A and B perfectly follows the previsions of Quantum Mechanics (as experience can demonstrate) if we do not initially put A and B in the position of "Union".

Indeed, Complex Relativity confirms the existence of "hidden parameters", and moreover precise what are those parameters, which consequently are no more "hidden" since they are now mathematically represented. Complex Relativity shows that the initial Union of A and B has for effect to produce between A and B an exchange of the data contained in their memory, each of the particle having after Union the cumulated and identical memory A + B. Now, since the behavior of each

particle depends (the psi-sigma field) of the outer situation (psi) and of its personnal significant memory (sigma), when A and B possess (after Union) the same memory and are confronted to a similar situation of the outer world (the half-opened/half-closed barrier), then they just have a propension to behave in the same manner--as would do twin brothers with similar Minds when put in similar situations.

3. Cooperative behaviors of the particles of a "living" body

The phenomenon of Union plays an important role not only in Physics, but also in Biology. Union seems to be a decisive factor in the understanding of the physical, and also mental, functioning of any living body.

According to Complex Relativity, Union would take place between the particles composing a living body from the time of conception (union of the original gametes) and then all through life. Union has for result that all particles entering the living structure have the same significant memory (same sigma field) and consequently are at each instant offered the same set B of possible behaviors. Each particle uses its own free-will when choosing, at each instant, one of these possible behaviors. But there enters into the Life game what is known in Mathematics and Physics as the "law of large numbers". There are billions of particles composing a living body, and all possible behaviors of the set B are accomplished in this way at each instant, when we consider the total large number of particles entering into the body structure. If set B is "designed" in such a manner that the "cooperative" behaviors of all particles cover all the functions required at each instant by the living body for a harmonious metabolism, then the natural free behaviors of the individual particles not only insures, but "makes", that this body is a "living" body. A living body is a structure made of particles of Matter where all particles "cooperate" to sustain a certain number of "functions", which precisely are functions that "define" Life. Consequently, Life is a set B of "behaviors" of individual particles of Matter. When we know the set B of functions to be covered by the particles to sustain Life, we also know (at least in principle) the memory structure (sigma field) and the physical "Form" of the living body (psi wave) which can give birth to such a set of possible behaviors B. For a large number of particles to freely cooperate together and finally obtain that all life functions are satisfied it is therefore sufficient (and necessary) that

all these particles have the same significant memory sigma: then each of them shall freely choose at each instant its own behavior, but the "large number" will make that, in this way, all functions necessary to Life will be satisfied through the "cooperative" behaviors of the totality of the particles entering the living body. Matter has here used its property of Union to obtain in this manner the free cooperation of a great number of particles in a living Organism.

As we see, all living functions are correctly covered as long as all particles keep their original significant memory leading to the set B of behaviors. But since each individual particle memorizes new data all along its own life, it seems that a harmonious functioning of a living body necessitates a periodic "re-alignment" of all particular memories by reference to some basic memory experiencing very little change, and being a kind of "guardian" of the original design. It looks as if this role of "guardian" was attributed by Life to the genetic elements (genes), since they are present in each cell and maintain their structure practically unchanged all through the life of the Organism. If these "guardians" start loosing some part of the original design (set B), we probably may expect a malfunctioning of some part of the living functions, and eventually the destruction of the complete living structure (death).

To be true, the role of Union in the functioning of a living body should be the object of thorough researches before we can precise the processes that take place, and the preceding reflexions should certainly be only considered as first tentative steps to explore a still largely unknown field of knowledge: but Union at the level of the individual particles should definitely be considered as a new possible window to look more closely at the Life phenomenon.

CONCLUSION

Let us conclude by coming back to the Forms/Symbols.

In order to understand that the sigma field present in each individual particle of Matter be a significant memory, it is necessary to admit that to a precise given Form of the outer

world must correspond a precise given structure of the "components" of the sigma field. In other words, there should exist a "bi-univocal" correspondence between the Forms of the outer world and the components (that is the Symbols) of the sigma field.

This problem is well known in Physics and is called the problem of "the field and its sources". If, for instance, you have electric charges moving in the outer world (these motions are the "Forms" present at this instant in the outer world), you simultaneously have a corresponding structure (components and their initial data) of the electromagnetic field. The knowledge of the motions of the electric charges (sources of the field) allows the knowledge of the precise structure of the electromagnetic field; but, reciprocally, the knowledge of the electromagnetic field allows the precise knowledge of the motions of the electric charges. In brief, Forms (sources) and Symbols (components of the field) have got a straightforward bi-univoqual correspondence, the "existence" of one implies unambiguously the "existence" of the other, and this is why we can say that, for the electromagnetic field, there "exists" a phenomenon source/field, and not source and field separately.

We have exactly the same type of "bi-univocal" correspondence between the Forms of the outer world and the Symbols of the inner world of each particle. To the Forms of the outer world correspond a Symbolic structure of the sigma field. The only (but very important) difference with the usual electromagnetic field and its sources, as Complex Relativity has shown, is that all particles have <u>not the same</u> symbolic structure associated to the Forms of the outer world. The sigma field, which is fundamentally of the electromagnetic type, may have "jump" variations, remaining of spin 1 (as the "ordinary" electromagnetic field) for certain particles, but going up to higher levels of spins (higher levels of "consciousness") for some particles. In other words, we could say that Forms ot the outer world and Symbols of the inner world always contitute a "unidуality" and correspond to each other (Form/Symbol), but also that the outer world suddenly <u>modifies itself</u> for a given particle when the symbolic sigma structure (inner world) of the particle suddenly "jumps" to another level of spin (of consciousness). In the same way as the outer world that is considered by a person suddenly changes at the instant this person, assumed to be blind at birth, suddenly gets the sense of vision.

So, Forms/Symbols are "relative" to the state of spin

(consciousness) of the observer's sigma field, the world is not an "absolute" but is strictly dependent of the mental structure interpreting the sensations collected by the living Organism <1>. The study of the relations between Forms and Symbols finally leads to a great lesson of tolerance.

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