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In the first part of this work[1] *we have explicated the spacetime structure of the probabilistic organization of quantum mechanics. We have shown that each quantum mechanical state, in consequence of the spacetime characteristics of the epistemic operations by which the observer produces the state to be studied and the processes of qualification of these, brings in a tree-like spacetime structure, a "quantum mechanical probability tree," that* transgresses *the theory of probabilities as it now stands. In this second part we develop the general implications of these results.*

Starting from the lowest level of cognitive action and creating an appropriate symbolism, we construct a "relativizing epistemic syntax," a "general method of relativized conceptualization" where—systematically—each description is explicitly referred to the epistemic operations by which the observer produces the entity to be described and obtains qualifications of it. The method generates a typology of increasingly complex relativized descriptions where the question of realism admits of a particularly clear pronouncement. Inside this typology the epistemic processes that lie—UNIVERSALLY—at the basis *of* any *conceptualization, reveal a tree-like spacetime structure. It appears in particular that the spacetime structure of the relativized representation of a* probabilistic *description, which transgresses the nowadays theory of probabilities,* is the general mould of which the quantum mechanical probability trees are only particular realizations. *This entails a clear definition of the descriptional status of quantum mechanics. While the recognition of the* universal *cognitive content of the quantum mechanical formalism opens up vistas toward* mathematical *developments of the relativizing epistemic syntax.*

The relativized representation of a probabilistic description leads with inner necessity to a "morphic" interpretation of probabilities that can be regarded as a formalized and deepening elaboration of Sir Karl Popper's "propensity" interpretation. *A functional is then constructed, the "opacity functional," that associates* a mathematical *expression to the Popperian "propensities". Furthermore the opacity functional produces a* deductive *definition of Shannon's "infor*

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mational entropy." Thereby there appears an explicitly unified relativized probabilistic-informational approach. This sketches out a second branch of a future mathematical epistemic syntax, to be connected with the branch stemming from quantum mechanics.

The problem of the objectivity of probabilistic descriptions acquires certain precise rephrasings and—in a sense—solution.

1. INTRODUCTION

Beyond the more specified results concerning exclusively the quantum theory, the first part of this work[1] brought into evidence a fact of a quite general nature: The two basic epistemic actions by which the observer—non removably involved—*introduces* an entity to be studied and *obtains* qualifications of it, possess *their own features* and these mark by non trivial characteristics the corresponding descriptions. *The descriptional relativities are rooted into the epistemic processes that lie BENEATH the objects and the qualifiers involved in a description.* So any mode of representation of real entities that leaves implicit the epistemic processes underlying a description, remains unaware of a fundamental stratum of relativities. Which means that it introduces surreptitiously *false absolutes.* These act then as hidden obstacles in the way of the subsequent conceptualizations, generating illusory problems and paradoxes.

In preceding works,[2,3] I have developed a *method of relativized conceptualization* founded on the explicit representation of the two basic epistemic operations by which the observer (or conceptor) introduces the object to be examined and obtains qualifications of it. These representations insure radically relativized descriptions where false absolutes cannot find shelter. The method generates a very synthetic typology of hierarchical chains of increasingly complex relativized descriptions. A sort of rudimental structure carrying only a few floorings located at some essential places of the processes of conceptualization of reality, but insuring crucial *references* for any particular elaboration. Thereby all the relativities involved in any phase of any given chain of conceptualization can be explicitly known. So all the dead angles incorporated in any fragment of knowledge can be identified. It becomes then possible to define modalities for *transgressing* these dead angles. Thus guided constantly by an exact perception of the acting constraints and of the available liberties, the processes of conceptualization acquire a reflexive, self-optimizing character. The stagnations against hidden false absolutes are dissolved as sophistic thinking has been dissolved by syllogistics.

The method of relativized conceptualization can be regarded as "a

relativizing epistemic syntax" that transcends the current languages, though of course it is specified by the unavoidable usage of these. It transcends even logic which itself transcends the current languages insofar as it is an artificial or "standard" language (Quine,[4] pp. 19–26) endowed with universal generality. *The method of relativized conceptualization FOUNDS logic by representing its operational roots explicitly and symbolically, and it incorporates it in the typology of relativized descriptions.* Indeed in logic one works with sentences where occur objects (represented by variables x or by singular terms a) and predicates (represented by functions $F(x)$, $F(a)$). Both these objects and these predicates are always *given.* They simply *are* there. When the processes of emergence of the objects and of the predicates are explicitly defined there appear in the representations of knowledge "sub-logical" characterizations. With respect to these logic—and the questions of truth to which logic is tied—acquire a secondary (derived) and particular nature. But the reconstruction of logic inside the method of relativized conceptualization will *not* be exposed in this work.

The following account is focused on the probabilistic conceptualization and on Sir Karl Popper's propensity interpretation.[5–7] The method of relativized conceptualization brings forth—in particular—a relativized reconstruction of the abstract theory of probabilities where are explicitly represented the *spacetime* features of the epistemic operations by which the observer introduces and qualifies the entities involved in the physical events (elementary or not) from probability spaces associated with physical phenomena. These features induce a tree-like spacetime structure, "the probability tree of an epistemic referential," which characterizes *universally* the *first* phase of *any* probabilistic description. At this point it appears laterally with respect to the main direction of the present exposition that the quantum mechanical probability trees identified in the first part of this work[1] are only a particular instance of the far more basic notion of probability tree of an epistemic referential: *Quantum mechanics has captured and has formalized—cryptically, but in mathematical terms—the very first and universal phase of any process of probabilistic conceptualization.* Such is the obscurely but strongly perceived universal value of the quantum mechanical formalism. But continuing along the main direction of exposition, the relativized extension of the abstract theory of probabilities brings forth *a full confirmation of the Popperian propensity interpretation of probabilities.* Namely a "morphic" interpretation where the Popperian interpretation first reappears stated in a precise symbolic language, and then acquires a mathematical expression. The deep and complex significance of Sir Karl Popper's concept of propensity shines forth strikingly.

The work ends with brief considerations on the relations between objectivity, truth and simplicity.

2. THE KERNEL OF A RELATIVIZING EPISTEMIC SYNTAX: THE "METHOD OF RELATIVIZED CONCEPTUALIZATION"

2.1. Preliminaries

As soon as an observer is in presence of some reality, knowledge and in particular descriptions can begin to arise. I use the word description, but to indicate what, exactly? And how does a process of description unfold? The possibilities that come in mind are so numerous and so diverse and the elements involved by them are so evasive, that one feels paralyzed. One asks oneself whether the question is not at the same time impossible and vain, whether it is not sufficient to describe without pretending to describe how one describes. Nor, *a fortiori*, how one should describe. Nevertheless the impression of impossibility *is certainly false*. Indeed a certain concept of description exists formed in our mind and it operates there as a filter, since we are able to recognize without much hesitation what seems to us to deserve the name "description" and what does not. So the query is to explicate and to optimize the criteria that exist and work in our mind. In a first stage it seems vital to overcome the entanglement of diversities eliminating all that is not common—universally—to strictly all the descriptions. The residue will necessarily seem very reduced. But it will certainly concentrate a fundamental and nontrivial significance that will have to be entirely trapped and drawn up into the explicit. And not by mere words incorporated in that or that current language that refracts in a random way the directions of designation; but by symbols which *through* the current language point outright to designata from "reality." Standing on this basis it will then be possible to affront the huge diversity of the possible descriptions, with the help of adequate and progressively complexifying specifications.

The approach attempted here banishes any feature that is factitious or excessive with respect to the powers really available for a human conceptor. The epistemic operations of man are ineluctably marked by *finiteness* and *discreteness*. As to infinities, each one is representable with the help of finite operations of which the number is unlimited. I choose to found this approach on these characters and on this possibility.

The finite and discrete epistemic operations that will be defined will be moreover researched such as to permit *reflexive* returns.

2.2. Epistemic Referential and Observer

Consider a man who wants to build descriptions. Imagine the *face à face* that precedes the beginning of this action. The man, with all his

recorders closed, stays blindly awaiting, immersed into the reality which he wishes to represent. Then the start-signal is given. The observer opens his recorders and begins to observe. What, exactly, has to happen in order that a description shall emerge? If the man runs the recorders of his body and of his devices everywhere, without favoring any portion of reality and without researching some preselected qualifications while excluding all the others, some perception will occur, but it will not be such that we shall accept to call it a description. It will only be a random and amorphous income of registrations. A mere manifestation of the pressure of imprints or perturbations imposed upon any portion of reality by other portions of reality. *The concept of a description involves certain requirements of structure, of coherence, of limitation.* These cannot be fulfilled without a certain *selective* and *stabilizing* attitude of the "conceptor" imposed on the one hand upon the portion of reality accepted as source of the registrations that are taken into account, and on the other hand upon the type of registrations that is researched. In order to characterize this attitude let us define a convenient language.

I denote by R: "reality"—physical, *conceptual*, WHATEVER—, the reservoir out of which *any* object of examination conceivable *at the considered time*, can be produced or chosen. So the content of this reservoir is defined here as a medium of potentialities that *evolves*, by physical processes *as well as* by conceptual ones.

Delimitator. An epistemic operator $\triangle$, defined on R, and which produces—as an object for ulterior examinations—an entity denoted $\eta_\triangle$ which *neither identifies with* $\triangle$ *nor includes it* but which otherwise is entirely unrestricted, will be called a "delimitator." We write symbolically:

$$\triangle R \rightarrow \eta_\triangle \qquad \text{or} \qquad \eta_\triangle \leftarrow \triangle R$$

So a delimitator $\triangle$ can consist of any mode of production, out of R, of an object for future examinations. This mode can involve operations that are exclusively physical, or exclusively conceptual, or any combination of both. Furthermore it can just select a preexisting object or on the contrary create an object. When I point my finger toward a stone that I want to be examined I delimit by a physical act, but not creatively. When I prepare a state of an electron in order to study it I delimit by a physical operation that is creative. When I define a new notion by words in order to examine it further I delimit conceptually and creatively. When I pick up in a dictionary the definition of a chair I make use of a conceptual delimitator that selects a preexisting abstract object. If I build a program for a Turing machine in order to examine the sequence of strings that it generates, I utilize an instructional delimitation that is conceptual and creative. Etc.

Aspect-View. Operation of Examination *Aspect. Values of an Aspect.* The symbol $\langle g \rangle$ will indicate an "operator of examination" called "aspect-view" that is defined on the—evolving—ensemble $\{\eta_\Delta, \forall \Delta\}$ of all the conceivable entities η_Δ (the domain of $\langle g \rangle$) and produces, *via* the corresponding "operation of examination" $\langle g \rangle \eta_\Delta$, a specified type of qualifications of the entities η_Δ (the range of $\langle g \rangle$), structured as follows. The index g (permitted to take on any graphic form, a letter, a group of letters, another sign) labels *globally* a whole *discrete* and *finite* but arbitrarily rich class of researched qualifications called "aspect g"; the qualifications from this class, pairwise distinct, are called the "values k of the aspect g," in short "gk values"; the aspect g, so the aspect-view $\langle g \rangle$ being considered to be defined *if and only if* a modality is fully prescribed for

- accomplishing the operation of examination $\langle g \rangle \eta_\Delta$ corresponding to the aspect-view $\langle g \rangle$;
- expressing the result in terms of values gk.

If the aspect g and the corresponding aspect-view $\langle g \rangle$ *are* defined in the aforespecified sense, then we *include* in the definition any object or device involved by the modality defining the operation of examination $\langle g \rangle \eta_\Delta$. We transpose in symbols as follows.

$$g \supset \bigvee_k gk,\ k \geqslant 1,\ k \in K, \qquad K\text{: an index set, finite and discrete but } \textit{arbitrarily rich}$$

$$gk \wedge gk' = \varnothing, \qquad \forall (k \neq k'), \qquad (k, k') \in K \tag{1}$$

which is to be read: The aspect g contains all the values gk (so the sign $\vee$ indicates a sort of "union"); if $k \neq k'$, the values gk and gk' of the aspect g have nothing in common (so the sign $\wedge$ indicates a sort of "intersection" and $\varnothing$ indicates "void").

We make use in Eq. (1) of the signs $\vee$ and $\wedge$ instead of the signs $\cup$ and $\cap$ utilized in the theory of ensembles. This in order to stress that the ensemblistic calculus is not *a priori* posited to hold for the values of any aspect, though it might be found to hold in the case of this or that particular aspect.

Notice that *in general no order relation is required among the values gk of an aspect g.*

According to our definition—where $k \geqslant 1$—, *an aspect g devoid of any value gk does not exist.* An aspect g "is" exclusively *via* its values. While a value gk of an aspect never exists *alone*: the ensemble of values gk is *strictly contained* in the corresponding aspect g (notice the sign of strict inclusion, *not* of equality): For every qualification, the human mind generates a semantic space to contain it, that emerges *different* from that qualification, namely more general than it, *even* if—as a limit—it contains that qualification alone. It emerges as a semantic ground on which it be possible to mark the particular site of that qualification, a "genus" ("proximus" or not). The preceding definition is faithful to this way of the human mind. I conceive of the semantic space g and of the sites gk inside it as being a hierarchically organized *reference-receptable* where (with respect to which) *any* real entity which manifests the value gk of the aspect g can find location, without any limitation of number or of time, indefinitely. In *this* sense we are in presence of an *aextensive and atemporal* reference receptacle. In mathematics this role is illustrated by a topological reference space (in particular an axis) with its topological reference subspaces (in particular its points). In logic this same role is illustrated by a genus and its specific differences. The concept of an aspect with structure (1) is a *generalization* (no order required for the values) of the already very basic concept of an axis made up of its points; and it is a certain *restrictive* elaboration (finiteness, discreteness) of the notion of a "genus" as a medium for "differentiations."

Finally, notice the distinctions and the relations between: an *operator* $\langle g \rangle$ (the aspect-view), the corresponding aspect g, and the corresponding *operation* of examination $\langle g \rangle \eta_\Delta$.

An example now: g can label the aspect named "color" ($g = c$) and k can then label the specifications "red" ($k = r$), "yellow" ($k = y$), "dark" ($k = d$). In this case the modality for accomplishing the operation of examination $\langle g \rangle \eta_\Delta$ and for expressing its result in terms of gk-values can be defined as follows. Produce three reference-entities or "samples" which, when directly looked at or when analyzed with a spectroscope, produce respectively the effects currently labeled by the words "red", "yellow" and "dark". Then look at the entity η_Δ or submit it to spectroscopic analysis and check whether the registered effect manifests identity with one or more among the reference-effects registered for the samples. If it does, say that the examination $\langle g \rangle \eta_\Delta$ produced the correspondingly named color-values. If it does not, say that it produced none such color-value. The samples and the spectroscope are then included in the definition of the considered color-aspect. This example is particularly simple, of course. If g labels what is indicated by the current term "intelligence," the corresponding examination $\langle g \rangle \eta_\Delta$ will call forth a much more complex and controversial definition. But *whatever* this definition, no matter how "convenient" or "stupid" it seems with respect to current language and to the available background of knowledge, once it has been specified as required it prescribes a way of acting on η_Δ and of expressing the effects of the action, and it includes in the definition of the considered aspect of "intelligence" all the devices necessary for accomplishing the action.

The set of all the conceivable aspects g is immensely rich. Its cardinal is probably higher then that of the continuum. Moreover this set is not entirely actualized, its content evolves while the complexity of the conceptualization increases. But in any given investigation the number of the aspects selected for being taken into consideration is necessarily *finite*. So it is adequate to form the notion:

View. We call "view" any ensemble $\{\langle g \rangle, g=1, 2,..., m\}$ of a *finite* but *arbitrarily big* number m of aspect-views $\langle g \rangle$ together with all the possible groups of joint aspect-views constructible out of these. We symbolize a view *in general* by te symbol $\langle\,\rangle$ (a void open eye). When we specify its content we introduce a sign (a capital letter, or another symbol) that labels that content.

The complexity and the degree of organization of a given view is determined by the number of aspects which compose it and by the structure assigned to the ensembles of values of these aspects: cardinal, origins, existence or not of an order, etc. In particular a view can consist of only one aspect-view, and even, as a limit, of only one aspect-view involving an aspect with only one value. But there is nothing final, nothing absolute in the distinction between view and aspect-view. Any aspect-view can be expanded into a view by a convenient analysis in other aspect-views. Conversely, any view can be contracted into a one-aspect-view by a process of synthesis of its various aspect-views.

No description can start without the explicit or implicit action of a certain pair $(\triangle, \langle\,\rangle)$, in succession or in simultaneity. While as soon as such a pair is constituted, descriptions can be attempted. For in this case a class of objects selected for qualification is specified, as well as a mode of qualification. So it is convenient to define now the assemblages of a delimitator and a view:

Epistemic Referential. Any pair $(\triangle, \langle\,\rangle)$ consisting of a delimitator and a view will be called an "epistemic referential."

An epistemic referential is already a complex cognitive equipment. But it is a concept *devoid of autonomy*, in its genesis as well as from a functional point of view. An epistemic referential presupposes choices of a delimitator and of a view and subsequent manipulations of these epistemic operators. These are all decided outside the considered referential, in a functioning usually labeled by the word "consciousness" I prefer to call it a "consciousness-functioning"—where arise the cognitive aims that dictate the construction $(\triangle, \langle\,\rangle)$ and its utilizations. In absence of a closure

by a consciousness-functioning the concept of epistemic referential leads outright to the paradoxes of knowledge without consciousness. These paradoxes that vitiate the nowadays microphysics are the ransom paid to a confused fear that subjectivity, truth and objectivity might be incompatible. They are the indigestible fruits of a preventive capitulation into a search for an "objectifying separation" between, on the one hand, the object of the description and the elements of reference, regarded as belonging to science, and on the other hand the consciousness, posed to be exterior to science. But I hold that such a separation is at the same time *non-necessary* and *illusionary* and that it is akin to a hasty amputation that falsifies and decomposes the conceptualization. Anyhow, the necessity of a consciousness-functioning in order to generate, to contain and to utilize any given epistemic referential, seems ineluctable. Later, when it will have become possible, inside the approach developed here, to formulate criteria for distinguishing between the qualifications of subjective, true, and objective, I shall examine the relations between these qualifications. If these really do raise some problem, I shall try to deal with it. But for the moment I define:

Observer. The basic cognant whole which emerges when a human being endowed with his consciousness-functioning, equips itself with one well-defined epistemic referential $(\triangle, \langle\,\rangle)$, will be called an observer.

(According to this language, the observer changes when a given human being changes its epistemic referential $(\triangle, \langle\,\rangle)$).

2.3. Relative Existence. The Frame-Principle. Relative Description

Suppose an observer, in the sense just defined. He can make use of the epistemic referential $(\triangle, \langle\,\rangle)$ that characterizes him. What results can this produce? The answer has a stratified structure.

Relative Existence or Non-Existence. Let $\eta_\triangle \leftarrow \triangle R$ be an entity delimited by the observer for qualification. Consider an aspect-view $\langle g \rangle \in \langle\,\rangle$ and a given value gk of the corresponding aspect g. The examination $\langle g \rangle \eta_\triangle$ either reveals to the observer the value gk, or it does not. If it does not we write

$$[\langle g \rangle \eta_\triangle \rightarrow \varnothing/gk] \sim [\nexists gk/\eta_\triangle, \nexists \eta_\triangle/gk] \qquad (2)$$

which has to be read: the examination $\langle g \rangle \eta_\triangle$ leads to void relatively to the value gk of the aspect g, or, the entity $\eta_\triangle$ and the aspect-value gk do not mutually exist.

If Eq. (2) holds for all the values gk, we write one of the following expressions

$$\begin{aligned}&[\langle g\rangle\eta_\triangle \to \varnothing/\langle g\rangle] \sim [\nexists\langle g\rangle/\eta_\triangle, \nexists\eta_\triangle/\langle g\rangle]\\ &[\langle g\rangle\eta_\triangle \to \varnothing/g] \sim [\nexists g/\eta_\triangle, \nexists\eta_\triangle/g]\end{aligned} \tag{3}$$

and we say that the examination $\langle g\rangle\eta_\triangle$ leads to mutual (relative) void, or that the entity $\eta_\triangle$ and the aspect-view $\langle g\rangle$ (or the aspect g) do not mutually exist.

If the non-existence of Eq. (3) is realized for all the aspect-views $\langle g\rangle \in \langle\,\rangle$ we write

$$[\langle\,\rangle\eta_\triangle \to \varnothing/\langle\,\rangle] \sim [\nexists\langle\,\rangle/\eta_\triangle, \nexists\eta_\triangle/\langle\,\rangle] \tag{4}$$

and we say that the operation $\langle\,\rangle\eta_\triangle$ leads to mutual (relative) void, or that the entity $\eta_\triangle$ and the view $\langle\,\rangle$ do not mutually exist.

If any *succession* of *two* operations $[\triangle R \to \eta_\triangle, \langle\,\rangle\eta_\triangle]$ leads systematically to the mutual inexistence of Eq. (4) we write symbolically

$$\triangle \perp \langle\,\rangle \tag{5}$$

and we say that the delimitator $\triangle$ and the view $\langle\,\rangle$ are mutually void or orthogonal or that the association $(\triangle, \langle\,\rangle)$ that has *a priori* been taken into consideration comes out *a posteriori* to be non-significant (which implies all the mutual inexistences from Eqs. (2)–(5). Finally, imagine that we let now the *observer* "vary," permitting usage, by the conceptor, of any view $\langle\,\rangle$. If then the succession of two operations $[\triangle R \to \eta_\triangle, \langle\,\rangle\eta_\triangle]$, accomplished with all the various views $\langle\,\rangle$ that we are able to conceive of, leads systematically, to the mutual inexistence of Eq. (5), we write symbolically

$$\triangle \perp R \tag{6}$$

and we say that *probably* (we never will be able to have tested for "all" the views, this notion is but a false absolute) the operation of delimitation $\triangle$ and R are mutually void or orthogonal.

If on the contrary now the examination $\langle g\rangle\eta_\triangle$ does reveal a value gk of the aspect g (or several such values), we write

$$\begin{aligned}&[\langle g\rangle\eta_\triangle \neq \varnothing/gk] \sim [\exists gk/\eta_\triangle, \exists\eta_\triangle/gk]\\ &[\langle g\rangle\eta_\triangle \neq \varnothing/\langle g\rangle] \sim [\exists\eta_\triangle/\langle g\rangle, \exists\langle g\rangle/\eta_\triangle]\end{aligned} \tag{7}$$

and we say that $\eta_\triangle$ and the aspect g, as well as the aspect-view $\langle g\rangle$, do mutually exist, namely *via* that (those) value(s) gk.

If the relation of Eq. (7) is realized for all the aspects $\langle g\rangle \in \langle\,\rangle$ we write

$$\langle\,\rangle\eta_\triangle \neq \varnothing/\langle\,\rangle] \sim [\exists\eta_\triangle/\langle\,\rangle, \exists\langle\,\rangle/\eta_\triangle] \tag{8}$$

and we say that the entity $\eta_\triangle$ and the view $\langle\,\rangle$ do mutually exist.

In both cases of relative existence (7) and (8) we write

$$[\exists\triangle/\langle\,\rangle], \qquad [\exists\langle\,\rangle/\triangle] \tag{9}$$

and we say that the association $(\triangle, \langle\,\rangle)$ *a priori* taken into consideration reveals itself *a posteriori* to be indeed significant. We can then also say, *a fortiori*, that $\triangle$ is not orthogonal on R.

By defining an epistemic referential as any association, entirely non-restricted, of any delimitator with any view, we have kept for this approach an *a priori* maximal generality. But afterwards the functioning of a given association $(\triangle, \langle\,\rangle)$ has produced the criteria for (5) and (6) of non-significance, as if spontaneously, in a way comparable to that in which certain functional incapacities eliminate living chimeras produced *in vitro*. Let us take notice of this fact which we perceive as *the germ of a strategy of conceptualization.*

At a first sight the formulation that follows Eq. (4) and leads to Eq. (5) might surprise. But on *what basis* could we posit that "all" the entities $\eta_\triangle$ produced by a fixed delimitator $\triangle$ (by reiteration of the operation $\triangle R \to \eta_\triangle$), are "identical" or "each time the same" just because the operation of delimitation $\triangle$ is each time the same one? The result $\eta_\triangle$ of the operation $\triangle R \to \eta_\triangle$ might depend also on R, which *evolves*. It depends certainly on the "place" in R on which $\triangle$ has worked, not only on $\triangle$ itself. Imagine for instance that $\triangle$ is an operation of preparation of some given state of an electron. If then $\triangle$ is applied on a place in the physical space where electrons have just been emitted, it will produce the desired state of an electron. But if that $\triangle$ is applied on a (conceptual) "place" of R consisting of a symphony by Beethoven, it will produce void. Furthermore: "identical," or "the same," *with respect to WHICH view?* "In itself"? And if—with respect to some *particular* aspect g all the entities $\eta_\triangle \leftarrow \triangle R$ produced by a fixed delimitator $\triangle$ do indeed bring forth invariably, identically, one and the same value gk, *why* should this happen also with respect to *another* aspect $g' \neq g$? And, *a fortiori*, why should this happen with respect to *ANY* aspect? If, while successively combining $\triangle$ with more and more different aspect-views $\langle g\rangle$, we happened to find that for *each* one of these, infallibly, the entities $\eta_\triangle$ produced by the operations $\triangle R \to \eta_\triangle$ *do* manifest some value gk of the corresponding aspect g *and* that when the sequence of operations $[\triangle R \to \eta_\triangle, \langle g\rangle \eta_\triangle]$ is *reiterated*, this value gk remains invariably *the same*, this would even seem miraculous! We simply cannot conceive of a type of entity that exists with respect to any view, and without "dispersion" of the values of the corresponding aspect. Anyhow, the *presupposition* of such an event would obviously be a huge false absolutization, quite fundamentally inconsistent with the very essence of our radically relativizing approach. So we systematically leave open the possibility that the reiterated use of one same delimitator $\triangle$ shall produce entities $\eta_\triangle$ which, with respect to that or this particular aspect g, might reveal, either a whole ensemble $\{gk,\ k = 1, 2,...\}$ of *different* values gk, or, systematically, relative void: This is one of the major implications encapsulated in the concepts of relative existence or inexistence defined earlier. This is what is stressed by the formulation leading from Eq. (4) to Eq. (5).

The definitions (2)–(4), (7), (8), express the fact that a view can qualify only an entity that can contribute by "abstraction" to the genesis of this view. The reflexive, double-way, zigzag dynamics which inextricably ties to one another the processes of abstraction and those of qualification, is here evoked in terms that explicate all the different and hierarchically related classes of relativities involved in the concepts of existence and of inexistence. Thereby "the" void or "the" negation $\varnothing$ as well as the existential quantifiers $\exists$ and $\nexists$, *split* into, respectively, a whole spectrum of relativized negations and of relativized existential quantifiers. The consequences are remarkable as it will appear progressively. For the moment I specify below only a most fundamental consequence which marks the very kernel of this approach.

The Spacetime Frame-Views. The Frame Principle FP. Consider the ensemble $\{E\mathbf{r}, \mathbf{r} \in \mathbf{R}\}$ of values $E\mathbf{r}$ indexed by the vectors $\mathbf{r} \in \mathbf{R}$ that specify, in the usual sense, the position in the physical space E. The position vectors $\mathbf{r} \in \mathbf{R}$ are supposed to be mesured with respect to some space-referential and making use of some given units of length and of angle. These units, by definition, are finite, whatever their value. So $\mathbf{R}$ is here a *discrete* ensemble of indexes. Furthermore, we choose it *finite*. So $\{E\mathbf{r}, \mathbf{r} \in \mathbf{R}\}$ is here a discrete and finite ensemble which allows us to introduce a "space-aspect" $\langle E\rangle$ with a structure (1). This aspect, furthermore, is of a semantic nature such that it *does* admit the definition of an *order*.

Consider now an ensemble $\{dt, t \in T\}$ of values t of the aspect d of *physical* duration. Such values can be determined only by the help of some clock incorporating some given unit of duration. This unit, whatever it be, is necessarily finite. Hence T is a *discrete* ensemble of indexes. We furthermore choose it also *finite*. Then $\{dt, t \in T\}$ is a discrete and finite ensemble

that allows us to define a "duration-aspect" $\langle d\rangle$ endowed with a structure (1). Moreover, again, the aspect thus defined is of a nature such that—MOST fundamentally in this case—it *does* accept the definition of an *order*.

The two aspects defined here do not incorporate the inner spatial and temporal aspects that a human being perceives by introspection. The inner durations are certainly more basic than the physical ones, to the implicit elaboration of which they contribute (while the prime sources of the inner spaces, in a certain very intricate sense, probably lie in the physical world). Here however we ignore any genetic problem concerning the concepts of space and time and we work directly with the already very complex constructs called physical space and physical duration.

Let us form now a "physical spacetime view" (in short, a "spacetime view") $\langle Ed\rangle = \{\langle E\rangle, \langle d\rangle\}$ consisting exclusively of a physical space aspect and a physical duration aspect. (I make use of the indefinite article "a" because there exists an infinity of such spacetime views, differing from one another by the magnitudes of the chosen unities and the number of the considered values (i.e., by the structure and the extension of the ensembles of indexes R and T), by the choice of the origins of space and of time, by the type and the orientation of the axes used in order to form the referential). These preliminaries serve to introduce the following

Frame Principle FP. Consider an aspect-view $\langle g\rangle$ and a *physical* entity $\eta_\triangle$ delimited for future examination. Whatever $\langle g\rangle$ and $\eta_\triangle$ be, if the entity $\eta_\triangle$ exists in the sense of Eq. (7) with respect to the aspect-view $\langle g\rangle$ then it also exists in the sense of Eq. (8) with respect to at least one view $\langle\ \rangle = \langle g\rangle \vee \langle Ed\rangle$ formed by associating the aspect $\langle g\rangle$ with a spacetime view $\langle Ed\rangle$. But the entity $\eta_\triangle$ is *non-existent* in the sense of Eq. (4) with respect to any spacetime view which acts *alone*, isolated from any other aspect-view $\langle g\rangle$. This feature will be expressed by saying that the spacetime views are only "frame-views" which, by themselves, are "blind." Symbolically we write

$$\begin{gathered} \exists\eta_\triangle/\langle g\rangle \to [\exists\langle Ed\rangle : \exists\eta_\triangle/\langle g\rangle \vee \langle Ed\rangle] \\ \langle Ed\rangle\eta_\triangle \to \varnothing/\langle Ed\rangle, \qquad \forall\langle Ed\rangle, \quad \forall\eta_\triangle \end{gathered} \tag{10}$$

As it is well known, Kant asserted that the human mind is such that it cannot conceive of "existence" outside space and time, which it introduces, intuitively and subjectively, as *a priori* "frames." This assertion has raised—and it still continues to raise—important questions. But the principle FP *isolates* exclusively a definite particular feature of Kant's conception which, I think, it would be difficult to contest. By the very nature of the functional laws of his consciousness, any mature and normal human observer has acquired a constitution such that he perceives himself as being the center of a spatial frame of reference (nonquantified) and as involving a (nonquantified) referential of time. And his behavior with respect to these referentials is that one specified in FP: As soon as he perceives or imagines a *physical* entity, *ipso facto* he introduces at least one aspect-view $\langle g\rangle \neq \langle Ed\rangle$ relatively to which the entity exists in the sense of Eq. (7) and the values of which aspect-view he *combines* with spacetime values, *thereby* locating this entity inside his spacetime. While by the use of the spacetime aspects *alone*, devoid *strictly* of any adjuvant aspect-view $\langle g\rangle \neq \langle Ed\rangle$ (color, consistency, whatever), he is unable to perceive or to *imagine* a physical entity at all. He simply cannot extract it out of the "transparent" background of spacetime values. The values of the spacetime aspect are conceivable and perceptible *only* by combination with some values of some other aspect, while the values of any other aspect irrepressibly emerge combined with some values of spacetime, even if fugitively, even if these spacetime values can be non-specified, and even if *a posteriori* they can be abstracted away. (Einstein's approach blurs the distinction between the aspect $g =$ mass and the spacetime view $\langle Ed\rangle$. More in fact: it inclines to contract the view $\langle g\rangle \vee \langle Ed\rangle$, $g =$ mass, into the spacetime $\langle Ed\rangle$ view alone. Which leads to *very* much confusion). This is a fundamental epistemic *fact* comparable with what gravitation is in the realm of the physical world. In order to be able to take this fact into account systematically, from now on we shall include a spacetime view in the view $\langle\,\rangle \in (\triangle, \langle\,\rangle)$ involved in any considered epistemic referential $(\triangle, \langle\,\rangle)$. So the minimal number of aspects in the view from any epistemic referential is from now on 3: E, d, and at least one aspect g. When a non-physical, a conceptual entity is considered, it is always possible, if convenient, to conceive that this entity does not exist with respect to the space-aspect involved by the utilized epistemic referential.

Relative Descriptions. The definitions of relative existence and the frame-principle FP yield finally a sufficient basis for a constructed answer to the question $\langle\,\rangle \eta_\triangle \rightarrow ?$

Relative Description. Consider an observer endowed with an epistemic referential $(\triangle, \langle\,\rangle)$. Let $\eta_\triangle$ be an entity delimited for future examination. If $\eta_\triangle$ does exist in the sense of Eqs. (7) or (8) with respect to the view $\langle\,\rangle$, then the examination $\langle\,\rangle\eta_\triangle$ reveals to the observer a certain particular *structure* of values gk of aspects g, $\langle g\rangle \in \langle\,\rangle$: certain association of values gk of aspects g which are permitted by the view $\langle\,\rangle$, do not arise for $\eta_\triangle$; others, on the contrary, are realized with certain characteristic relative frequencies. This structure is called "a description of the entity $\eta_\triangle$ relatively to the view $\langle\,\rangle$." in short, "a relative description of $\eta_\triangle$," and it is denoted by the symbol $D(\triangle, \eta_\triangle, \langle\,\rangle)$. We write

$$\langle\,\rangle\eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \langle\,\rangle)$$

The notation $D(\triangle, \eta_\triangle, \langle\,\rangle)$ accentuates that any description involves a triad $(\triangle, \eta_\triangle, \langle\,\rangle)$ to which, fundamentally, it is relative. The distinction—by the *separate* specification, in the argument of D, of $\triangle$ and of $\eta_\triangle$—between the relativity with respect to $\triangle$ and the relativity with respect to $\eta_\triangle$, draws permanent attention upon those, among the aforementioned features of this approach of which the importance is essential. Namely that:

— It would be at the same time devoid of significance, inconsistent, and most probably factually false, to posit *a priori* and absolutely that all the results $\eta_\triangle$ of the reiterations of the operation $\triangle R \rightarrow \eta_\triangle$ realized with a fixed delimitator $\triangle$, are identical for any view $\langle\,\rangle$, "because" the delimitator is each time the same.

— It would *equally* be an arbitrary restriction and a false absolutization to posit *a priori* that the reiterations of a succession of the *two* operations $[\triangle R \rightarrow \eta_\triangle, \langle\,\rangle\eta_\triangle \rightarrow D]$ certainly leads always to identical descriptions D if *both* epistemic operators, the delimitator *and* the view, are each time the same. (For instance: Suppose that the produced entity $\eta_\triangle$ is a physical one. The acting view $\langle\,\rangle$, by definition, includes a *finite* spacetime view. This spacetime view might possess a structure (1) (cardinals of the ensembles of indexes T and $\mathbf{R}$) such that it is able to cover during *one* act of examination $\langle\,\rangle\eta_\triangle$—only a spacetime domain of which the extension is *smaller* than that one revealed later *via* precisely the examinations $\langle\,\rangle\eta_\triangle$—by "the whole" entity $\eta_\triangle$. If this happens the various examinations $\langle\,\rangle\eta_\triangle$ from a sequence of reiterations of the succession of two operations $[\triangle R \rightarrow \eta_\triangle, \langle\,\rangle\eta_\triangle \rightarrow D]$ will in general produce descriptions that are different because they concern *different fragments* of the delimited entity $\eta_\triangle$, in spite of the fact that the utilized delimitator and view are each time the same). Though all the descriptions produced by reiterations, with some *fixed* pair $\triangle$ and $\langle\,\rangle$, of the succession of the two operations $[\triangle R \rightarrow \eta_\triangle, \langle\,\rangle\eta_\triangle \rightarrow D]$, *can* come out to be identical, quasi certainly *this cannot happen for ANY choice* $(\triangle, \langle\,\rangle)$. In these conditions it is indeed *necessary* to introduce in the argument of the symbol $D(\triangle, \eta_\triangle, \langle\,\rangle)$ a *separate* reference to each one of the three elements $\triangle$, $\eta_\triangle$, $\langle\,\rangle$.

By construction, any relative description is itself distinct from the delimitator, from the object-entity, and from the view involved by it, to all three of which it is conceptually posterior. While the three enumerated elements are distinct from each other. ALWAYS by their descriptional *roles*, and in general also by their content. In consequence of this the concept of relative description constructed here does not accept inside the class it delimits the designata of certain "introspective" associations of words[8] like for instance "I have 45 lines" or "I am telling a lie": these, from a purely grammatical point of view, are well formed. But they violate the distinctions and the successions required *methodologically* by the definition posited here for a relative description, so they are excluded. Such exclusions by no means constitute an impoverishment. Nothing hinders to select any association of words as an object for examination and, by the help of the method developed here, to research its specific descriptional powers as well as its specific descriptional incapacities.

The concept of a relative description defined above bears by construction the mark of the deliberate finitistic character which characterizes the epistemic operators $\triangle$ and $\Diamond$: Because the ensemble of values gk of any aspect g is discrete and finite by definition and because any view contains by definition a finite number of aspect-views, any examination $\Diamond\eta_\triangle$ produces a finite ensemble of qualifications. So a relative description $D(\triangle, \eta_\triangle, \Diamond)$ is a *cell* of symbols of an "artificial" language (gk-values) confined inside a "syntactic unity," but associated, *via* the epistemic operators $\triangle$ and $\Diamond$, with *channels for adduction of semantic substance* from R (directly or indirectly).

The case, particular but very important, of the descriptions of *physical* entities, can be now singularized as follows.

Relative Description of a Physical Entity. Consider an observer endowed with an epistemic referential $(\triangle, \Diamond)$ and let $\eta_\triangle$ be an entity delimitated for examination. In consequence of the frame principle FP expressed by Eq. (10) we have by convention $\Diamond \supset \Diamond_{Ed}$. If $\eta_\triangle$ is a *physical* entity and if it exists in the sense of (7) or of (8) with respect to the view $\Diamond \in (\triangle, \Diamond)$, the frame principle FP (10) entails that the examination $\Diamond\eta_\triangle$ reveals to the observer a "form" determined by values gk of the aspects g, $\Diamond_g \in \Diamond$, displayed on the ordered spacetime grating involved by the spacetime view $\Diamond_{Ed}$ contained in the view $\Diamond$. We call this form "a relative description of the physical entity $\eta_\triangle$" and we indicate it by the *same* symbol $D(\triangle, \eta_\triangle, \Diamond)$ used for any description.

It will appear that the characterization of the form of spacetime-gk-values which emerges *via* the successions of operations $[\triangle R \rightarrow \eta_\triangle$, $\Diamond\eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \Diamond)]$ involved by a process of relativized description of a physical entity, is a highly non-trivial question.

2.4. The Principle of Separation PS. Relative Metadescription

The Principle of Separation PS. A human observer, in presence of reality, is condemned to parcelling examinations. The successivities inherent in human mind, the spatial confinements imposed by the bodily senses (whatever prolongations are adjusted to them), and the absence of limitation of what is called reality, compose together a configuration which imposes the fragmentation of the epistemic search. On the other hand any fragment selected or produced out of the changing continuum of "reality," admits an infinity of different sorts of examinations. Furthermore, *any newly accomplished qualification multiplies the conceivable qualifications*, raising the question of the relations with itself. These confinements and these endless and changing vistas call forth hastes or panics of the mind, that entangle false problems. These knots have to be hindered. Systematic and indefinite progressions, free to endlessly generate new branches, have to be insured along any chosen direction of conceptualization, whatever its curvature and no matter whether it is pointed forward or is turned back upon itself in reflexive analysis. We have to build for the mind a free, an indefinitely organizing penetrability into any nook of this substance of the knowable where mind is immersed and of which mind thickens the texture by ceaseless complexifications. But how can this aim be reached? Only an appropriate *methodological* decision could meet this question.

Let us go back to the definition of a relative description. According to this definition each relative description is essentially referred to one triad $(\triangle, \eta_\triangle, \Diamond)$. The relativity to this triad *limits* the capacity of information of the considered description. *Relativity and limitation are indissolubly tied to one another*. Any given relative description, we saw, is a confined cell of language able to produce only a finite number of qualifications all concerning only one class of objects (those introduced by one fixed delimitator). This confinement, however, this dam incorporated in any one description, is constantly exposed to founder under the non-dominated fluxes of the epistemic actions. The human minds are dominated by whirls of implicit interrogations which generate an imperious tendency to *fluctuate* between different operations of delimination, different object-entities, different views. A tendency to work out simultaneously several different descriptions. But as soon as several different relative descriptions are attempted simultaneously, the roles and the contents of the delimitators, the views and the object-entities involved dispose of a ground for oscillation. And then the oscillations actually happen because it is very difficult to perceive them, so *a fortiori* to hinder them. So the different descriptions that are attempted simultaneously get mixed and in general none of them can be achieved. Their superposition ends up in a knot of miscomprehensions that blurs and stops the conceptualization. So it is necessary to erect high and solid ramparts between two distinct descriptions. For this purpose I pose the following *methodological* "principle" (a *norm*, a rule of epistemic behavior):

The Principle of Separation PS. Since *each* relative description $D(\triangle, \eta_\triangle, \Diamond)$, whatever its complexity, involves by definition one delimitator, one object-entity and one view, distinct from each other as well as from the description, as soon as *any* change either of role or of content is introduced in the triad $(\triangle, \eta_\triangle, \Diamond)$ *another* description emerges: THIS OTHER DESCRIPTION HAS TO BE TREATED SEPARATELY.

In the syntax of the processes of relativized conceptualization the systematic observance of the principle of separation plays a role analogous to that played by the word "stop" or by the sign "." in the transmission of messages. Or else, a role analogous to that played in the algebraic calculi by the closure of a bracket opened before. This principle delimits the own domain of one commenced description. It announces its saturation. It rings the bell as soon as have been exhausted all the qualifications bearing on the object-entity $\eta_\triangle$ delimited by the delimitator $\triangle$ acting inside that description, and which can be achieved *via* the view $\Diamond$ operating inside that description. It announces that from now on, if one desires to complexify further the descriptional tissue produced by the description that has been achieved, one has to start a new description, specifically appropriate for the conceived supplementary aim. This can be done either by introducing, *via* a convenient new delimitator, an enriched or a supplementary object-entity, or by using a new view involving new values of the same aspects or new aspects, or by combining these two sorts of possible changes. Conducted in this way the processes of description can be developed under a permanent control which guarantees them against the incrustation of ambiguities or of paradox-generating false absolutes.

The separations commanded by the principle of separation are not amputating. Quite on the contrary, they insure a maximal and governed utilization of the capacities of conceptualization. For instance, consider a description $D(\triangle, \eta_\triangle, \Diamond)$. The delimitator $\triangle$, the view $\Diamond$ and the object-entity $\eta_\triangle$ have been specified and on this basis there emerged qualifications of the object-entity $\eta_\triangle$. But exclusively of *it*. According to the definitions introduced here a delimitator $\triangle$ and a view $\Diamond$ cannot be qualified inside a description where they act, respectively, as a delimitator and a view. So if one researches qualifications of also this delimitator $\triangle$ or of this view $\Diamond$, one has to organize another description where this time the delimitator $\triangle$ or the view $\Diamond$ will be the object-entity, or be part of the object-entity. But *nothing hinders* to construct such a description.

In this sense the principle of separation permits to penetrate inside a preceding description, to "split" it *a posteriori*, in a "legal" way and to work out specifications concerning the epistemic operations that brought for this description, so specifications concerning its genesis. The principle of separation permits to transgress one-way orders, it permits reflexive to and fro epistemic actions.

But the principle of separation permits also to *transgress* "legally" a preceding description by reconsidering it *globally* as a new object-entity, alone, or in connection with other entities. This occurs *via* the generation, required by the principle of separation, of a relativized variant of the well known and central concept of metadescription.

Relative Metadescription. Consider a relative description $D(\triangle, \eta_\triangle, \Diamond)$. Both by construction and in consequence of the requirements imposed by the principle of separation, this description cannot qualify itself. But nothing hinders to research qualifications of $D(\triangle, \eta_\triangle, \Diamond)$ considered as a whole. We only have to respect the requirements of the principle of separation and erect another epistemic referential in which the relative description $D(\triangle, \eta_\triangle, \Diamond)$ appears as the object-entity and the chosen view is such that it permits to qualify it in any desired way. More generally, inside an adequate epistemic referential any ensemble of previously achieved relative descriptions can reappear as an object-entity admitting of qualification:

Relative Metadescription. Consider a *conceptual* delimitator $\triangle^{(2)}$ which selects as an object for future qualification any ensemble $E_{\triangle^{(2)}}$ $E^{(2)} = \{D(\triangle, \eta_\triangle, \Diamond)\}$ of previously realized descriptions. Let $\Diamond^{(2)}$ be a view with respect to which all the descriptions from $E_{\triangle^{(2)}}$ do exist in the sense of (8). The description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \Diamond^{(2)}, E^{(2)})$ will be called "a metadescription relative to the ensemble of descriptions $E^{(2)}$ $\{D(\triangle, \eta_\triangle, \Diamond)\}$."

The concept of relative metadescription endows us with a new and preorganized space of conceptualization, hierarchically connected with the preceding one. There it becomes possible to unfold a whole category of apparent problems and paradoxes that one might think to perceive concerning the "first" level of descriptions $D(\triangle, \eta_\triangle, \Diamond) \in E^{(2)}$, and to resolve them accordingly to *algorithms*. These, "automatically," lead to descriptional structures which are "legal" according to the method developed here. Now, since a description $D \in E^{(2)}$ is *any* description, it can be itself a relative metadescription. So it is possible to develop an infinite number of non limited hierarchies of descriptions of increasing complexity. On each new level the choices of the new delimitator and the new view amount to a free redefinition of the *direction* (the aim) of the desired new segment of conceptualization. In this way unlimited branchings of increasingly complex descriptional structures can be developed, which can be directed toward any desired descriptional aim.

The kernel of the method of relativized conceptualization is now entirely exposed. It sketches out a "relativizing epistemic syntax $[\triangle, \eta_\triangle, \diamond, D]$" (the "[delimitator, object-entity, view, relative description] syntax"). Before putting it to work steadily we shall first close this section by a brief illustration of the reflexive powers of the method: We shall comment upon certain essential features of the method, by the help of the method itself.

2.5. Reflexive Return Upon the Method

Specificities. The relativizing epistemic syntax $[\triangle, \eta_\triangle, \diamond, D]$ is founded on the definitions of the two fundamental epistemic operators—delimitators $\triangle$ and views $\diamond$—that characterize the process by which emerge the considered object-entities and the qualifications of these. The two fundamental epistemic operators $\triangle$ and $\diamond$ have been introduced as operators

- explicitly specified
- *permitted* in general to be constructed *independently of*
  - *the object-entity* $\eta_\triangle$
  - *one another*
- susceptible of any *a priori* pairing off $(\triangle, \diamond)$.

The *a priori* possibility of these mutual independences cuts out conceptual room for

- incorporating each qualification *gk*, in a whole *STRUCTURE (1) for qualification*
- distinguishing between
  - *physical* delimitators and *abstract* delimitators
  - delimitators that *create* the object-entity $\eta_\triangle$ to be studied, and delimitators that only *select* it.

These basic choices are specificities of the relativizing epistemic syntax constructed here. In the various previous representations of reality or of knowledge, the objects to be studied and the qualifications researched are also specified, of course. If they were not, no description at all would be possible. But, we remarked, the way in which these objects and these qualifications are obtained are usually left more or less implicit. Even in

logic where, on a *basic* level, one writes $\exists x(F(x), x = a)$ (there exist objects "x" such that they possess the property "$F(x)$" and "a" is such an object): The objects "x" and "a" simply *are there*. Correlatively, no clear distinction is made between creating a previously inexistent object, or selecting an object that preexists. The distinction between physical or conceptual creation or selection remains also sporadic and vague. The properties (predicates) "F" and "$=$" also are just posited to be there. These, furthermore, are not integrated into some specified structure for qualification. Each predicate is conceived of *isolately*. In short, all the questions concerning the processes that generate the considered objects and the qualifications of these are left to epistemology and to the philosophy of logic (where, as for now, they have been examined mainly in essays on aspects of the phenomenon of *language*). Whereas logic itself deals directly about language, not about epistemic facts. However certain remarkable explicit statements or questions concerning the very first epistemic actions can be found in the theories of computing machines, of artificial intelligence, or of artificial life. And also in the theory of chaos which comes rather near to quantum mechanics in certain respects. These cases of exception, however, offer only still scattered and particular insights. (For instance, like in meta-mathematics, the considered object-entities, systematically, are exclusively conceptual, even when they are creatively delimited). In this situation, the *possibility*, in principle, of *mutual independence* between the definitions of [the object; the way of producing the object; the qualificators; the processes of qualification] has *never* yet been explicitly perceived. So *a fortiori* the crucial importance of this possibility remained hidden. Below bring it into evidence.

The Reasons for Independently Definable Delimitators and Views. In any description, unavoidably, some delimitator and some view are at work. When the definitions of these are not independent, this is always found to be associated with transgressable, so unnecessary restrictions. Consider the following examples.

In the primitive theory of ensembles (Aristote, Boole) the objects from the ensemble are never supposed to be created out of the continuum of reality. They are supposed to have been selected by "pointing toward them." This is an operation that introduces the objects independently of any pre-decided qualification, but not also independently of the objects *themselves*: in order to be selectable by pointing, the objects have to *preexist*, actually, and their number has to be *finite*. Which are transgressable, so unnecessary restrictions.

Indeed Cantor, Frege, Russel, have reacted by considering also infinite ensembles $\{x\}$ of objects x which, instead of being selected by direct indication, are determined by the specification of a property $F(x)$ (predicate) required to be "true" for all the objects from the ensemble $\{x\}$. But this definition *also* entails non necessary restrictions. Some of these stem from the introduction—methodologically *premature at this stage*—of the concept of truth. But others, still more basic, stem this time from a dependence of the delimitator involved, on the view which acts. To show this let us translate into our terms the Cantor-Frege definition of an infinite ensemble: It is akin to considering the infinite ensemble $\{x\}$ of "all" (atemporally) the entities x that exist in the sense of (8) with respect to a given view $\Diamond$ that includes the qualification "F" in its structure (1): $\Diamond \supset F(x)$. Which amounts to the use of a particular type of delimitator that can pertinently be defined as "the delimitator $\triangle(\Diamond)$ of the view $\Diamond$." So $\{x\} \sim \{\eta_{\triangle(\Diamond)}\}$. But then $\triangle(\Diamond)$ is once more a *selector*, the selector which selects out of R the "field of perceptibility of $\Diamond$." So we have $\{\eta_{\triangle(\Diamond)}\}$: $\triangle(\Diamond) \sim$ [the selector of the field of $\Diamond$]. Which *by construction involves the following relative existences (8)*:

$$\forall \eta_{\triangle(\Diamond)}, \qquad [\eta_{\triangle(\Diamond)} \leftarrow \triangle(\Diamond)R] \Rightarrow \exists \eta_{\triangle(\Diamond)}/\Diamond$$

Now, this relative existence involved by the Cantor-Frege delimitator is tied—*very* surreptitiously—with a new sort of non necessary restrictions. This becomes apparent with respect to the following reference. Consider the special but fundamental case of a delimitator $\triangle$ which

— is exclusively of a *physical* nature (independent of any view or aspect, just communicated by an ensemble of instructions)
— involves only devices, not the observer's senses (view, hearing, etc.),
— *creates* the corresponding entities $\eta_\triangle$.

In this limiting case, as we have already accentuated, *the symbol* $\{\eta_\triangle\}$ *can designate a class of entities that emerge ENTIRELY unqualified.* The operations $\triangle R \to \eta_\triangle$ exclusively *form* the entities symbolized $\eta_\triangle$ and *trap* them as objects for *subsequent* examinations that can generate perceivable qualifications of these objects. But *at its emergence* an entity from the class $\{\eta_\triangle\}$ did never *yet* manifest itself perceivably. Nevertheless, in a still *A-CONCEPTUAL* status, only *physically*, it is delimited. It is *physically DEFINED*, it has been brought into existence and *endowed with quite definite specific characteristics*: In quantum mechanics *any* chain of research begins by such a purely physical delimitation which marks the zero point of that chain (Ref. 1, pp. 1408–12). So a *pragmatically efficient* definition of an *infinite* class $\{\eta_\wedge\}$ of entities, and *knowledge* about them, are notions that can be *radically separated* from one another. And this

entails a gain of generality, of freedom of conceptualization, because concerning an infinite ensemble of entities $\{\eta_\triangle\}$ introduced in *this* way, an infinity of conceivable future knowledges is available, instead of only this or that predefined knowledge $F(x) \subset \Diamond$. *This is a major lesson learned from quantum mechanics.* By permitting delimitators that are independent of any view we have incorporated it in the method of relativized conceptualization.

To understand fully how this works, let us build an explicit comparison between the effect of the physical delimitator $\triangle$ independent of any view considered above and the effect of a Cantor-Frege delimitator of a view $\triangle(\Diamond)$.

In the case of a Cantor-Frege delimitator, a view $\Diamond$ is defined first, independently, and this entails a corresponding delimitator $\triangle(\Diamond)$. Symmetrically, the independent specification—first—of a delimitator $\triangle$, entails the existence of a certain particular "corresponding" view, "the view $\Diamond(\triangle)$ of the delimitator $\triangle$," where: $\triangle$ is the considered delimitator, so with domain R and result a class of entities $\{\eta_\triangle\}$ that *a priori* is infinite; $\Diamond(\triangle)$ is a view (so with domain $\{\eta_{\triangle'}, \forall\triangle'\}$ (any sort of entity) and result a description) which involves only one aspect, namely $g=$ "delimited by the delimitator $\triangle$," endowed with two values, $g1=$ "yes" (or $g1=$ "the entity $\eta_\triangle$ has been delimited by the delimitator $\triangle$") (which characterizes the entities $\eta_\triangle$), and $g2=$ "no" (or $g2=$ "the entity $\eta_{\triangle'}$ has not been delimited by the delimitator $\triangle$") (which characterizes all the other entities). Now, for *any* delimitator $\triangle$, all the entities from the corresponding ensemble $\{\eta_\triangle\}$ do satisfy by construction to at least one common property, namely the property—known *a priori*—of having been delimited by precisely that delimitator $\triangle$. This property emerges irrepressibly and "reflexively" as a consequence of the general definitions of a delimitator and of a view and of the particular definition of the view $\Diamond(\wedge)$ of a delimitator $\triangle$ just introduced. Its emergence can be represented inside our relativizing epistemic syntax by asserting the corresponding description:

$$[\eta_\triangle \leftarrow \triangle R] \Rightarrow [\Diamond(\triangle)\eta_\triangle \to [D(\triangle, \eta_\triangle, \Diamond(\triangle))] \quad \text{where}$$

$$D(\triangle, \eta_\triangle, \Diamond(\triangle)) \qquad (S_1)$$

$$\sim [\text{"the entity } \eta_\triangle \text{ has been delimited by the delimitator } \wedge\text{"}]$$

The mere use of ANY delimitator $\triangle$ *involves already the existence of this sort of "minimal definition" from* (S_1) *for the infinite ensemble* $\{\eta_\wedge\}$ *of entities produced by an unlimited succession of reiterations of the operation* $\wedge R$. Now, from the point of view of knowledge (conceptualized) this is a sort of "idempotent" definition that adds no new information with respect to the information already contained in the mere specification of the delimitator to be utilized. It says only that the delimitator $\triangle$ has worked, not *how* the entities $\eta_\triangle$ *themselves* ARE. *Nevertheless*, and this is most remarkable indeed, it is an *efficient* definition, in the sense that it *SUFFICES* for singularizing with respect to the "rest" of reality the entities from the infinite ensemble $\{\eta_\triangle\}$ and for keeping them available to be studied, to be utilized for the acquisition of subsequent, newly informative *knowledge* (conceptualized) about the entities themselves. This is so because the operation of delimitation $\triangle R \to \eta_\triangle$ *DETERMINES physically ALL the POTENTIALITIES* of the entities $\eta_\triangle$, albeit in a non expressed, a-conceptual way. Actualized knowledge is renounced here in favor of only potential knowledge. But this offers unlimited potential knowledge instead of only this or that definite actualized knowledge. *The so peculiar force and so radical novelty of the quantum mechanical formalism stems precisely from the full utilization of this sort of deal that introduces a purely physical determination of monoliths of as yet unknown but also entirely unrestricted potentialities.*(1)

Let us now examine what happens if, in (S_1), instead of the non restricted delimitator $\triangle$, we introduce a Cantor-Frege delimitator of a view $\triangle(\Diamond)$. We obtain:

$$[\eta_{\triangle(\Diamond)} \leftarrow \triangle(\Diamond) R]$$
$$\Rightarrow [\Diamond'(\triangle(\Diamond))\, \eta_{\triangle(\Diamond)} \to D(\triangle(\Diamond), \eta_{\triangle(\Diamond)}, \Diamond'(\triangle(\Diamond)))]$$
$$[D(\triangle(\Diamond), \eta_{\triangle(\Diamond)}, \Diamond'(\triangle(\Diamond)))] \qquad (S'_1)$$

$\sim$ ["the entity $\eta_{\triangle(\Diamond)}$ has been delimited by the delimitator $\triangle(\Diamond)$ of the view $\Diamond$"]

where the symbol (a *global* symbol) $\Diamond'(\triangle(\Diamond))$ stands for the view (a metaview) of the Cantor-Frege delimitator $\triangle(\Diamond)$ of the view $\Diamond$. What does this mean? At a first sight (S'_1) might seem to still involve, like in (S_1), no conceptualized information whatever about how the considered entities *themselves* ARE. It might seem to still inform us, exactly like in the general case (S_1), *exclusively* about how these entities are *produced*, about what *the operation of obtention* of these entities is. In other terms, it might seem at a first sight that we continue to be in presence, for the infinite ensemble of entities $\{\eta_{\triangle(\Diamond)}\}$ involved in (S'_1), of a "minimal definition" of the same type as that from (S_1). But in fact, because the delimitator is now the delimitator of a given view $\Diamond$, a selector, the information (S'_1) concerning the mode of production of the corresponding entities $\eta_{\triangle(\Diamond)}$ amounts to an information about how these entities themselves are: they are selected such as to *exist in the sense of (8) with respect to the view* $\Diamond$. So they are such as to *certainly* manifest, under an examination $\Diamond \eta_{\triangle(\Diamond)}$, some

values of aspects from $\Diamond$. So, in contradistinction to the entities $\eta_\triangle$ from the infinite ensemble created by the delimitator $\triangle$ from (S_1), the entities $\eta_{\triangle(\Diamond)}$ from the infinite ensemble selected by $\triangle(\Diamond)$ are pre-qualified *conceptually*, not only physically: we *know* in advance something about how they would appear themselves under a definite examination, namely under the examination by $\Diamond$. And the point is that this is an *a priori restriction* which is not *necessary*. Indeed, we saw, the "minimal definition" from (S_1): $D(\triangle, \eta_\triangle, \Diamond(\triangle)) \sim$ ["the entity $\eta_\triangle$ has been delimited by the delimitator $\triangle$"], that involves no sort of restriction whatever, is nevertheless pragmatically sufficient for starting a chain of knowledge. A chain which—because it is not restricted—is richer. So, if we confined ourselves, for infinite ensembles, exclusively to the Cantor-Frege definition, a whole class of infinite ensembles *that ARE usefully defined* would be eliminated: There would be a non necessary loss of generality.

We are free to consider infinite ensembles of entities generated by delimitators of *any* sort. We are free to use delimitators (conceptual or *physical*) that are independent of any view, just as much as views (conceptual or *physical*) independent of any delimitator. And we need *know* nothing at all about the entities that will come in: The relative existences and inexistences can *afterward* bring forth any researched dependence or independence, or compatibility; the relative descriptions can *afterward* produce any researched conceptualized information. As we say in France, we need not place the oxen in front of the ox-cart. We can *a priori* permit maximally and then come back reflexively to choose and purify. Recognition of these liberties is a new step on the way of the relaxation of the arbitrary implicit restrictions that hamper our way of conceptualizing reality.

These examples suffice for explaining why we have required possibility, in general, of mutual independence between the delimitator, the object entity and the view from a relative description. But nothing forbids to leave *non-utilized* one or the other among the mutual independences permitted *a priori*. We have instated a liberty, not an obligation. If this liberty is not utilized in this or that process of conceptualization, particular situations arise. That is all. For each one of these the method, *via* the posited definitions and principles, *prescribes algorithms* for the obtention of the correct description, thus avoiding stagnation in front of false problems as well as consideration of descriptions which, according to the method, are deficient. For instance, we have shown that a view $\Diamond$ can determine a "corresponding" delimitator $\triangle(\Diamond)$ which depends on this view and that a delimitator $\triangle$ can determine a "corresponding" view $\Diamond(\triangle)$ which depends on this delimitator. If then one wants to make use of the epistemic referentials $(\triangle(\Diamond), \Diamond)$, (the Cantor-Frege case) or $(\triangle, \Diamond(\triangle))$, or $(\triangle(\Diamond), \Diamond'(\triangle(\Diamond)))$ (as it happened in the schemes (S_1), (S'_1)), the resulting descriptions can be immediately identified *and distinguished from each other* unambiguously, *formally*, notwithstanding their confusing self-referential features. This is so because the *roles* played by a delimitator and by a view, respectively, in the elaboration of any relative description, are distinguished from each other inside the symbolic rendering $D(\triangle, \eta_\triangle, \langle\,\rangle)$ of a description, they are characterized by specific symbols and places. While the principle of separation PS protects from confusing shiftings.

3. FUNDAMENTAL TYPES OF RELATIVE DESCRIPTIONS

3.1. Transferred Description. Transfer-Tree of a Basic Epistemic Referential

Throughout what follows we shall restrict ourselves exclusively to descriptions of *physical* entities.

How does human mind *penetrate* into the domain of descriptions? What are the *primary* descriptions? The following definition introduces to an answer.

Transferred Description. Consider an observer endowed with an epistemic referential $(\triangle, \langle T \rangle)$ where:

- $\triangle$ is a purely physical operation which delimits physical and as yet strictly non described entities $\eta_\triangle$.
- $\langle T \rangle$ is a view such that every aspect-view $\langle g \rangle \in \langle T \rangle$ involves an aspect g consisting of a union of values gk which, themselves, are features of a material object for "g-registrations" (a "g-apparatus"), in general *variable* with g, features that are perceivable *on* this g-registering object, in consequence of interactions between it and the entities $\eta_\triangle$ delimited by the delimitator $\triangle \in (\triangle, \langle T \rangle)$ ("measurements of the aspect g on entities $\eta_\triangle$"). A view $\langle T \rangle$ of the type just specified will be named "a transferred view."

The epistemic referential $(\triangle, \langle T \rangle)$ will be called a "basic epistemic referential." Any description of the physical entity $\eta_\triangle$ generated by a basic epistemic referential will be called a "transferred description" and it will be denoted $D(\triangle, \eta_\triangle, \langle T \rangle)$.

So any description generated with a basic epistemic referential involves exclusively features of registering objects *distinct* from the physical entity $\eta_\triangle$ delimited for examination. At a first sight the concept of a transferred description might seem particular, and too radical. But in fact it possesses

absolute priority and non restricted generality inside the order of cognitive elaborations: *Any* entity delimited by *any* delimitator, *if* it *does* mark the consciousness of an observer, marks it *first via* a certain particular category of transferred descriptions, namely descriptions transferred on the domains of sensitiveness of the observer's body. Kant, Poincaré, Einstein, Quine, have founded famous analyses on the explicit recognition of this fact. And if—more generally now—the transferred view $\langle T \rangle \in (\triangle, \langle T \rangle)$ does not involve these biological terminals, the nearest and which cannot be eliminated, if this view is formed with registering aspects of objects still *exterior* to the observer's body, then the corresponding description belongs to the generalized type of transferred description defined above. This description constitutes then an intermediary object $[\eta'_{(\triangle)} \equiv D(\triangle, \eta_\triangle, \langle T \rangle)]$ which, if it is perceivable by the sensorial "views" (in our sense) of the observer's body, can *found* the access of the entity denoted $\eta_\triangle$, to the observer's functioning-consciousness, marking the 0-point of a chain of conceptualization of this entity. This situation is *systematically* encountered in microphysics: a microsystem which is not directly perceivable, produces, on macroscopic registering devices, marks that are perceivable by the sensorial views of the observer's body. In any case:

A transferred description is a first phase UNIVERSALLY traversed by ANY representation of a physical entity.

The Transfer-Tree of an Epistemic Referential. What sort of "form" in the sense of the general definition of the relative description of a physical entity—can a transferred description generate?

The transfer-view $\langle T \rangle$ which acts in a basic epistemic referential $(\triangle, \langle T \rangle)$ contains a certain finite number $m \geqslant 1$ of aspects g which are distinct from the two frame-aspects E and d contained in $\langle T \rangle$ (see the convention introduced on the basis of the frame-principle PF). In general $m > 1$. Now, every aspect-*view* $\langle g \rangle \in \langle T \rangle$ is by definition a *physical* interaction. So—inside *another* convenient epistemic referential (see PS)—each such interaction for an examination *via* $\langle g \rangle$ can *itself* hold the role of a physical object-entity. This physical object-entity then, accordingly to the frame-principle FP, *involves necessarily a certain spacetime support, and this entails certain mutual exclusions*: It is not possible to act on *one* single outcome $\eta_\triangle \leftarrow \triangle R$, involving a definite spacetime support, simultaneously, in *various* manners which themselves involve *various* spacetime supports. It is not possible *in general* to realize simultaneously *all* the examinations $\langle g \rangle \eta_\triangle$ corresponding to *all* the aspect-views $\langle g \rangle \in \langle T \rangle$, on the result $\eta_\triangle$ of *one* single realization of the operation $\triangle R \rightarrow \eta_\triangle$. So the aspects $\langle g \rangle$ from the basic view $\langle T \rangle$ *separate*. The set of these aspect-views *branches* *out* into a number $1 \leqslant l \leqslant m$ of subsets of aspect-views $\langle g \rangle \in \langle T \rangle$ which, with respect to one realization of the epistemic action $\Delta R \rightarrow \eta_\Delta$, are mutually incompatible. But all the examinations *via* aspect-views $\langle g \rangle$ belonging to *one* of these subsets *are* realizable simultaneously on the result of one single realization of the epistemic action $\Delta R \rightarrow \eta_\Delta$, i.e., they *can* constitute together one single, more complex examination. Let us denote by $\langle b \rangle$, $b = 1, 2, \ldots, l$, $1 \leqslant l \leqslant m$, such a more complex sub-examination, simultaneously, by all the compatible aspects from one "branch" (subset) and let us call it a "branch-view" from $\langle T \rangle$. The $1 \leqslant l \leqslant m$ mutually incompatible branche-views obtained in this way constitute a partition of $\langle T \rangle$ (making abstraction of the frame-view $\langle Ed \rangle$): $\langle T \rangle = \bigvee_b \langle b \rangle$. From this it follows that, in order to accomplish *one* complete transferred description of "the" entity η_Δ it is necessary to *reiterate* the operation of delimitation $\Delta R \rightarrow \eta_\Delta$ a number of times $1 \leqslant l \leqslant m$, completing it *successively* by the $1 \leqslant l \leqslant m$ mutually incompatible branch-examinations $\langle b \rangle \eta_\Delta$. In other terms, in order to achieve one transferred description $D(\Delta, \eta_\Delta, \langle T \rangle)$ one must accomplish separately, successively, all the $1 \leqslant l \leqslant m$ sequences of two operations $[\Delta R \rightarrow \eta_\Delta, \langle b \rangle \eta_\Delta]$, $b = 1, 2, \ldots, l$. This leads in the end to a tree-like spacetime structure of the ensemble $\{[\Delta R \rightarrow \eta_\Delta, \langle b \rangle \eta_\Delta], b = 1, 2, \ldots, l\}$ of sequences of two epistemic processes which determines one transferred description. (The Fig. 1 represents an example with three branches.) As a whole, the structure previously defined is a [potential-actualization-actualized] structure that will be called "the transfer-tree of the basic epistemic referential $(\Delta, \langle T \rangle)$."

Consider now the transferred description $D(\Delta, \eta_\Delta, \langle T \rangle)$. It emerges as a first "interpretation" of the minimal description from (S_1) namely $D(\Delta, \eta_\Delta, \langle\,\rangle(\Delta)) \sim$ ["the entity η_Δ has been delimited by the delimitator Δ"]. But this interpretation will certainly *not* be perceived as satisfactory, as *final*. Each branch of the tree of the basic epistemic referential $(\Delta, \langle T \rangle)$ corresponds to a registering-object specific of that branch, a $\langle b \rangle$-apparatus. So the values *gk* of the transferred aspects *g*, $\langle g \rangle \in \langle T \rangle$, are perceptible *on* the *l* different domains of space occupied by *l* different registering devices, $1 \leqslant l \leqslant m$. Furthermore, notwithstanding the fact that the origin of times is reestablished after each sequence of two operations $[\Delta R \rightarrow \eta_\Delta, \langle g \rangle \eta_\Delta]$, the *gk*-values produced by these sequences appear in general after *different* times $t(g)$. This entails in general different durations of emergence $t(b)$ for the different branch-descriptions $D(\Delta, \eta_\Delta, \langle b \rangle)$. In short, the form of *gk*-spacetime values defined by a transferred description of an entity η_Δ is in general a shattered form, a form scattered on a non connected domain of the ordered spacetime grating $\langle Ed \rangle$ included in the view $\langle T \rangle$. A form which in general *does not even permit the definition of a law of evolution, of an own global temporal order*

of what is labeled η_Δ. In such conditions *how* can we ascertain even only the *existence* of some *significance* for the assertion that the achieved description concerns indeed an (one) "entity η_Δ," and an entity η_Δ *different* from all the registering objects *whose* features—*exclusively*—contribute to that description? Obviously, as soon as a transferred description

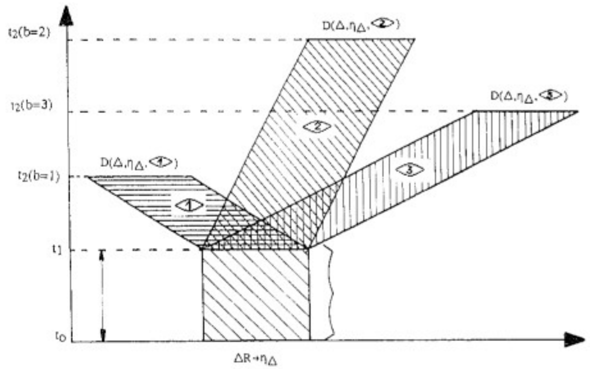

Fig. 1. The transfer-tree of a basic epistemic referential $(\Delta, \langle T \rangle)$. The operation of delimitation $\Delta R \rightarrow \eta_\Delta$—common—generates the trunk of the structure, *a monolith of non expressed and unknown but physically determined potentialities labeled by the symbol* η_Δ *and relative to the operation* Δ *alone*. The operation of delimitation Δ is identically reiterated for all the sequences $[\Delta R \rightarrow \eta_\Delta, \langle b \rangle \eta_\Delta]$. It begins at an initial moment t_0, always the same with respect to the origin of times *reestablished* after each sequence, and it lasts until a time $t_1 > t_0$. From the moment t_1 on, the spacetime supports of the epistemic operations which lead to a transferred description of the entity η_Δ *separate* into $1 \leqslant l \leqslant m$ branches, one for each one of the sub-examinations $\langle b \rangle \eta_\Delta$ where combine several examinations $\langle g \rangle \eta_\Delta$ simultaneously realizable on a result η_Δ of *one* single operation of delimitation $\Delta R \rightarrow \eta_\Delta$. All the different examinations $\langle b \rangle \eta_\Delta$ begin at the same time t_1 when the operation of delimitation $\Delta R \rightarrow \eta_\Delta$ finishes (with respect to the origin of times reestablished after each sequence $[\Delta R \rightarrow \eta_\Delta, \langle b \rangle \eta_\Delta]$) but each one of them *finishes* at a *specific* time $t(b)$, $b = 1, 2, \ldots, l$. Each branch examination $\langle b \rangle \eta_\Delta$ is *a process of actualization of a part* of the potentialities contained in the monolith of potentialities symbolized η_Δ; namely those which are relative to the partial view $\langle b \rangle$. In contradistinction to the process of delimitation (creation) $\Delta R \rightarrow \eta_\Delta$ that is relative to the operator Δ alone, the process of actualization $\langle b \rangle \eta_\Delta$ is relative to *both* the operation of delimitation Δ *and* the view $\langle b \rangle$. At the top of each branch b, the operation of actualization $\langle b \rangle \eta_\Delta$ produces a corresponding *actualized* result, namely the partial transferred relative description $D(\Delta, \eta_\Delta, \langle b \rangle)$, $b = 1, 2, \ldots, l$, "the branch-description *b*."

$D(\triangle, \eta_\triangle, \langle T\rangle)$ is achieved, we are confronted with a new question of "interpretation," involving this transferred description itself and its relation with the entity $\eta_\triangle$. This new question of interpretation is already exterior to the prime a-cognitive stratum of reality where the minimal description from (S_1) is buried. It is this time a conceptual metaquestion. Let us examine this metaquestion closer.

3.2. Individual Description or Statistical Description. The Relativity of Statisticity

A remarkable fact comes now into light: The entity labeled $\eta_\triangle$ will *not* be kept inside the realm of the conceptualized, if, when one *REITERATES* the *GLOBAL* epistemic action which establishes the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$, no sort of *invariance* emerges. Indeed we find out—as we would find out that this plate is broken!—that, if no invariance whatever were brought forth by reiterations of, globally, the whole description $D(\triangle, \eta_\triangle, \langle T\rangle)$, we would *a posteriori* retire to the ensemble of data symbolized by $D(\triangle, \eta_\triangle, \langle T\rangle)$ the qualification of "description of an entity $\eta_\triangle$," even though *a priori* we did endow this ensemble of data with this qualification. So this was only a provisional, a conditional endowment, implicitly subject to subsequent tests. A kind of tactical labeling, just in order to obtain a working-ground on which to hoist up our understanding so that *afterwards* we might become able to decide which direction has to be retained for the fragment of conceptualization that we try to build. The emergence of some invariance tied with reiterations of the description $D(\triangle, \eta_\triangle, \langle T\rangle)$ appears to play the role of a sort of proof of existence deciding whether yes or not what has been tentatively labeled $\eta_\triangle$ deserves further attention. (Note that this is the second time that a "tactical confidence" can be observed to work inside the present approach. We have already remarked its action when the definition (5) of relative inexistence of a delimitator and a view has eliminated *a posteriori* certain pairings $(\triangle, \langle\ \rangle)$ which, *a priori* had been taken into consideration tentatively. Then, like now, this tactical confidence is a particular manifestation of the essentially reflexive character of the method.)

So, it seems, we must now examine reiterations of the considered transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$, i.e., an ensemble of realizations of this description. But why? Because we perceive more or less implicitly that when we define an aspect-view $\langle g\rangle$ corresponding to an aspect $g =$ "variance" endowed with a value $g1 =$ "invariant" and a value $g2 =$ "not invariant," not only the still strictly non qualified entity $\eta_\triangle$ that was the object of the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$, but even this

description itself, are inexistent in the sense of Eq. (3) with respect to this aspect. Accordingly to usual language the aspect-view $\langle g\rangle =$ "variance" exists in the sense of Eq. (7) only with respect to an entity which: (a) is already *prequalified* by some *other* aspect or view, i.e., consists of some already previously accomplished *descriptions*, not of still strictly unqualified objects; (b) consists of *at least TWO* descriptions, and in general of an ensemble of descriptions, so that comparisons be possible. Which imposes indeed the study, now, of an *ensemble* $\{D(\triangle, \eta_\triangle, \langle T\rangle)\}$ of descriptions. So the object of examination has changed. Then, accordingly to the principle of separation PS, *another* description has to be built in order to qualify this new object. A convenient metadescription placed on a metalevel. The method literally ejects us on a metalevel.

Imagine then an ensemble of N reiterations of the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. *Each* description $D(\triangle, \eta_\triangle, \langle T\rangle)$, in its own turn, involves the realization of *all* the sequences of two operations $[\triangle R \rightarrow \eta_\triangle, \langle g\rangle\eta_\triangle \rightarrow \eta_{gk}]$ (where η_{gk} stands as an abbreviation for $D(\triangle, \eta_\triangle, \langle g\rangle)$: a gk-qualified entity), corresponding to all the aspect-views $\langle b\rangle \in \langle T\rangle$ (grouped in mutually incompatible subsets). Let us symbolize more synthetically by the writing $[\triangle R \rightarrow \eta_\triangle, \langle T\rangle\eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \langle T\rangle)]$ this ensemble of sequences leading to *one* description $D(\triangle, \eta_\triangle, \langle T\rangle)$. And let us symbolize N reiterations of the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$ by the writing $\{[\triangle R \rightarrow \eta_\triangle, \langle T\rangle\eta_\triangle \rightarrow D_j(\triangle, \eta_\triangle, \langle T\rangle)], j = 1, 2,..., N\}$ where j labels the description produced by the jth reiteration. Now, what a sort of invariance can be expected concerning these N reiterations of the description $D(\triangle, \eta_\triangle, \langle T\rangle)$?

The type of invariance which comes first into mind is the identity of all the descriptions $D_j(\triangle, \eta_\triangle \langle T\rangle)$. However—and it is very important to realize this fully—*nothing* authorizes to presuppose precisely identity. This would be an entirely arbitrary presupposition. Some *other* sort of "invariance" might arise as well, or *none*. So, accordingly to the method applied here, the only way toward capturing perhaps a precise definition of some invariance concerning what we have provisionally labeled "one entity $\eta_\triangle$," is to effectively construct the convenient metadescription *without* in any way prejudging the results that will arise. And notice that what is at stake here is huge: $D(\triangle, \eta_\triangle, \langle T\rangle)$ labels any transferred description, so any first phase of any access to knowledge of any physical entity $\eta_\triangle$. In absence of the emergence of a precise definition of some possible invariance connected with a label $\eta_\triangle$, the foundation of any reasoning on the physical world dissolves, and even the foundation of any coherent language.

One realization of the succession $[\triangle R \rightarrow \eta_\triangle, \langle T\rangle\eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \langle T\rangle)]$ of epistemic operations brings forth one description $D(\triangle, \eta_\triangle, \langle T\rangle)$. This by definition consists of a certain *configuration* of qualifications gk, $\forall \langle g\rangle \in \langle T\rangle$, displayed on the spacetime support of the spacetime frame-view $\langle Ed\rangle$ contained in $\langle T\rangle$. By their association with spacetime values from the spacetime frame-view $\langle Ed\rangle$, these qualifications gk generate a certain form of spacetime-gk-values. Let us label *globally* by h this form of spacetime-gk-values. We do not know whether, when the descriptional action $[\triangle R \to \eta_\triangle, \langle T\rangle\eta_\triangle \to D(\triangle, \eta_\triangle, \langle T\rangle)]$ is reiterated N times, the obtained forms $D_j(\triangle, \eta_\triangle, \langle T\rangle) = h$ ($j = 1, 2,..., N$, j: the index of order of the reiteration) will or not come out to be all identical). So let us introduce the notation $h = 1, 2,..., L$, $L \leqslant N$, in order to express that we leave open the possibility that the index h will vary from one reiteration of the description D to another one, thus indicating a certain number L of different results. We now define:

Individual Description or Statistical Description. Let $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ be a metadescription where:

— $E^{(2)} = \{D_j(\triangle, \eta_\triangle, \langle T\rangle)\} = \{h\}$ is an ensemble of results of N reiterations of the elaboration $[\triangle R \to \eta_\triangle, \langle T\rangle\eta_\triangle \to D_j(\triangle, \eta_\triangle, \langle T\rangle)]$ of the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$ ($j = 1, 2,..., N$: the index of *order* of the result, $h = 1, 2,..., L$: the symbol of *content* of the result, $L \leqslant N$).

— The metadelimitator $\triangle^{(2)}$ is a *conceptual selector* which selects $E^{(2)}$ as object of examination.

— The metaview $\langle S\rangle^{(2)}$ is a "global statistical metaview" with respect to which $E^{(2)}$ exists in the sense of Eq. (8) and which possesses the following structure:

$\langle S\rangle^{(2)} = \bigvee_g \langle sg\rangle^{(2)}$, $\forall \langle g\rangle \in \langle T\rangle$, with $\langle sg\rangle^{(2)}$: a "statistical view relative to $\langle g\rangle$" possessing in its turn the following structure:

$\langle sg\rangle^{(2)} = \langle g\rangle \vee \langle ng\rangle^{(2)}$, $\langle ng\rangle^{(2)}$: the "view of g-population" corresponding to the "aspect ng of g-population," of which the values are defined as follows: From each description $D_j(\triangle, \eta_\triangle, \langle T\rangle) = h$, filter out exclusively the sub-configuration $h(g)$, $h(g) = 1, 2,..., L(g)$, $L(g) \leqslant L$, of the qualifications of spacetime-gk-values of the considered aspect g *alone*; then estimate, inside the ensemble of the N results $D_j = h$, the relative frequencies $n(gh)/N$ of occurrence of the different identified sub-configurations $h(g)$ where the value of the index h is bounded this time by the number $[L(g) = h(g)] \leqslant L$ (which transforms h in $h(g)$).

If the global examination $\langle S\rangle^{(2)}E^{(2)}$ produces for *all* the aspects $\langle g\rangle \in \langle T\rangle$ a Dirac (dispersion-free) distribution of the corresponding numbers $n(gh)/N$, i.e. if one finds for every aspect $\langle g\rangle \in \langle T\rangle$ one content-value h_i such that $(n(gh_i)/N) = 1$ and $n(gh)/N = 0$ for $h \neq h_i$, then the descriptions D_j are all identical. In this case we shall say that the initial description $D(\triangle, \eta_\triangle, \langle T\rangle)$ is an "*individual* transferred description of the entity $\eta_\triangle$" while $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ has come out to be equally an individual description, namely of the individual description $D(\triangle, \eta_\triangle, \langle T\rangle)$ of the entity $\eta_\triangle$: $\langle T\rangle$ is, with respect to $\triangle$, a "genotypical view" that generates *one* typical transferred description of $\eta_\triangle$. If on the contrary the examination $\langle S\rangle^{(2)}E^{(2)}$ reveals for at least one aspect $\langle g\rangle \in \langle T\rangle$ a non null dispersion of the numbers $(n(gh)/N)$, then the descriptions D_j are not all identical. In this case we shall say that the initial description $D(\triangle, \eta_\triangle, \langle T\rangle)$ is an instable form while the metadescription $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ is a "statistical description of the initial description $D(\triangle, \eta_\triangle, \langle T\rangle)$," or, simpler, a "statistical description of the entity $\eta_\triangle$."

The new concepts of an individual or a statistical relative description bring into evidence all the distinct conceptual levels and all the relativities which are called into play when one tries to associate a definite significance to a physical entity $\eta_\triangle$ that has been delimited—as yet strictly unqualified—by a purely physical operation of delimitation $\triangle$. In particular, the definition posited above entails quite clearly that, the delimitator $\triangle$ being fixed, the "statisticity" or the "individuality" of a description $D(\triangle, \eta_\triangle, \langle T\rangle)$ *can appear or disappear* when the utilized view $\langle T\rangle$ is changed. This last relativity displaces on an entirely new ground the innumerable ancient or actual controversies—all erroneously absolutizing—concerning "the" determinism and "the" causality. However, alone, this relativization is still insufficient for cutting out the whole conceptual volume of this debate. This so ancient and so fundamental debate displays its complete volume only when furthermore *an explicit and radical distinction is inserted between the ONTIC notion of (relative) "determination" and the EPISTEMIC notion of "previsibility."*

Examine now the spacetime structure of the description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$. The statistical view $\langle S\rangle^{(2)}$ that acts in this description contains by definition the basic view from the epistemic referential on which the description $D^{(2)}$ is founded, which by definition, is a *transfer-view* $\langle T\rangle$ that induces a tree-like spacetime structure in the basic description $D(\triangle, \eta_\triangle, \langle T\rangle)$ (Fig. 1). This in its turn induces a tree-like spacetime structure for the statistical decription $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ also. In fact what emerges is a complexification of the transfer-tree of the basic epistemic referential $(\triangle, \langle T\rangle)$ (Fig. 2).

So the concept of transfer-tree of a basic epistemic referential reappears as a particular instance of another more complex concept where it is explicitly connected to all the relativities of statisticity: Once more the essentially reflexive character of the method manifests itself, spontaneously generating complexifying retours upon its own constructs. We *re*-name now the initially defined structure—more specifically—"the transfer-tree of an individual transferred description." The more general complexified tree-like structure defined just above will be called "the transfer-tree of a statistical

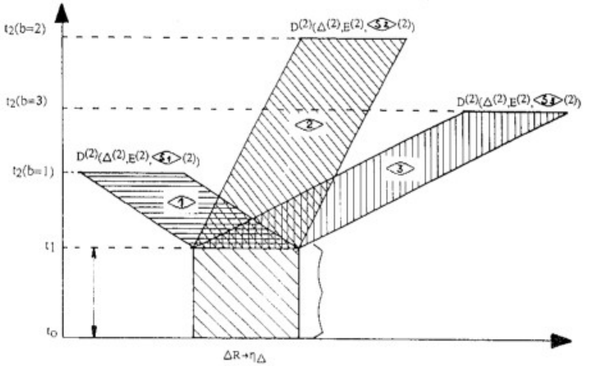

Fig. 2. The transfer-tree of a statistical transferred description. First repeat the reading of the caption of the Fig. 1. Remember now that in order to *determine* whether a partial branch-description $D(\Delta, \eta_\Delta, \langle b\rangle)$ is individual or not, this partial description has to be *reiterated* a big number of times, *globally*. An ensemble of N reiterations of the partial description $D(\Delta, \eta_\Delta, \langle b\rangle)$, b fixed, is thus obtained. This ensemble has to be examined by the g-statistical aspects $\langle Sg\rangle^{(2)} \in \langle S\rangle^{(2)}$ relative to all the aspects $\langle g\rangle \in \langle b\rangle$, to determine the respective dispersions. If all the dispersions for all the aspects $\langle g\rangle \in \langle b\rangle$ are zero then the partial statistical metadescription $D^{(2)}(\Delta^{(2)}, E^{(2)}, \langle b\rangle^{(2)})$ as well as the partial description $D(\Delta, \eta_\Delta, \langle b\rangle)$ are individual and the considered branch b is "an individual branch of the statistical metadescription $D^{(2)}(\Delta^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$": $\langle b\rangle$ is a "genotypical branch-view with respect to Δ." If on the contrary one finds a nonzero dispersion for at least one aspect $\langle g\rangle \in \langle b\rangle$ then the partial metadescription $D^{(2)}(\Delta^{(2)}, E^{(2)}, \langle b\rangle^{(2)})$ is statistical and the considered branch b is "a statistical branch of the global metadescription $D^{(2)}(\Delta^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$." If all the branches $b = 1, 2, \ldots, l$ are individual then the whole metadescription $D^{(2)}(\Delta^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ is an individual metadescription (of the individual description $D(\Delta, \eta_\Delta, \langle T\rangle)$ of the entity η_Δ) possessing the spacetime structure that has been previously called the transfer-tree of the epistemic referential $(\Delta, \langle T\rangle)$: $\langle T\rangle$ is a "genotypical transfer-view, with respect to Δ," *i.e.* it generates *one* typical description for the entities $\eta_\Delta \leftarrow \Delta R$ produced by Δ.

transferred description." The definition of an individual or statistical description offers a basis for progress concerning our fundamental question: does the transferred description $D(\Delta, \eta_\Delta, \langle T\rangle)$ correspond to an "existing" entity η_Δ?

3.3. Intrinsic Metaconceptualization of an Individual Transferred Description

Suppose that the metadescription $D^{(2)}(\Delta^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ appears to be an *individual* metadescription of the initial description $D(\Delta, \eta_\Delta, \langle T\rangle)$. Then by definition the N attempted reiterations j, $j = 1, 2, \ldots, N$ of the sequence of epistemic actions $[\Delta R \rightarrow \eta_\Delta, \langle T\rangle\eta_\Delta]$ have all led to identical transferred descriptions $D_j(\Delta, \eta_\Delta, \langle T\rangle)$. This identity *is* an invariant (relative to $\langle T\rangle$) with respect to the index of reiteration j. Namely it is precisely the simplest sort of invariant that came spontaneously in mind but which we refused to assert *a priori*. What is the situation now? Though we still know *nothing* concerning "how" the entity η_Δ is "itself," we are already in possession of a first argument for the assertion that the label η_Δ designates "an entity": the transferred decription $D(\Delta, \eta_\Delta, \langle T\rangle)$ is a *stable* form. This first argument subsists even if we have found only *one* transfer-view $\langle T\rangle$ with respect to which the mentioned invariance does emerge, and even if this view consists of only one aspect, with only one value.

Nevertheless, and no matter whether the transfer-view $\langle T\rangle$ is very simple or very complex, because the description $D(\Delta, \eta_\Delta, \langle T\rangle)$ is a transferred individual description, the spacetime form $D(\Delta, \eta_\Delta, \langle T\rangle)$ remains defined in terms of aspects of registering objects which are all distinct of the result η_Δ of the operation of delimitation ΔR. It is a scattered form. And a form which, when it is considered globally, cannot be ordered by a unique time-parameter. Such a form, even though it is now known to be invariant with respect to the reiterations of the epistemic action $[\Delta R \rightarrow \eta_\Delta, \langle T\rangle\eta_\Delta \rightarrow D(\Delta, \eta_\Delta, \langle T\rangle)]_j$, is irrepressibly perceived as only a *preliminary* step in the process of search of an "interpretation" for the label η_Δ. The current language, faithfully reflected by the whole terminology introduced here, expresses this fact: we speak of a description which concerns *one* entity η_Δ that is *different from all the registering objects* which bear on them the values of the transferred aspects involved by the view $\langle T\rangle$, and that, though *individual*, is *transferred*. From the beginning on, more or less implicitly, we experience a belief and we posit a corresponding *a priori* decision that "an entity" possesses a certain "own" or "intrinsic" form that is *separable* from the apparatuses on which it produces perceptible marks. *Such* is the epistemic method that works spontaneously inside our mind. We can but recognize it as a *fact*.

So a new question arises: How can this intrinsic form decreed for the entity $\eta_\triangle$ be qualified? Remarkably, there exists a quite definite answer. In our terms it can be expressed as follows.

Intrinsic Metaconceptualization of an Individual Transferred Description. Intrinsic Model. Consider an individual transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. Let $\partial(\mathbf{r}, \eta_\triangle, t)$ be a connected space-domain on which the entity $\eta_\triangle$ is conceived to exist "intrinsically," i.e., independently of any observation, at a time t that marks (statistically the initial moment of the processes of transfer, reestablished for each pair of sequences $[\triangle R \rightarrow \eta_\triangle, \langle g\rangle \eta_\triangle]$ involved by the description $D(\triangle, \eta_\triangle, \langle T\rangle)$. (On the Fig. 1 $t = t_1$). Let furthermore $\langle I\rangle^{(2)}$ be an "intrinsic metaview" such that any aspect i involved by this view is a functional $\Phi[D(\triangle, \eta_\triangle, \langle T\rangle)]$ of the initial transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$ of which the "values" h (non numerical in general) realize on the *connected* domain $\partial(\mathbf{r}, \eta_\triangle, t)$. Let $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ be the description of $\eta_\triangle$ *via* these intrinsic aspects. The metadescription $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle TI\rangle^{(2)})$ where $\triangle^{(2)}$ selects conceptually for examination the ensemble $E^{(2)}$ of the two descriptions $D(\triangle, \eta_\triangle, \langle T\rangle)$ and $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ and where the metaview $\langle TI\rangle^{(2)} = \langle T\rangle \vee \langle I\rangle^{(2)}$ contains all the aspects of the view $\langle T\rangle$ and of the metaview $\langle I\rangle^{(2)}$ as well as the aspects of relation between the aspects from these two views, will be called an "intrinsic metaconceptualization of the individual transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$."

The description $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ which corresponds to the aspects of the intrinsic metaview $\langle I\rangle^2$ *alone*—without reference to the genesis of the intrinsic aspects i from $\langle I\rangle^{(2)}$ as fonctionals of the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$—will be called an "intrinsic model of the entity $\eta_\triangle$."

An intrinsic metaconceptualization $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle TI\rangle^{(2)})$ realizes a spacetime integration of the scattered form introduced by the initial transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. The change of view $\langle T\rangle \rightarrow [\langle TI\rangle^{(2)}$ with $\langle TI\rangle^{(2)} \supset \langle T\rangle \vee \langle I\rangle^{(2)}$ operates a focalizing projection of the scattered transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$, onto the *connected* and *instantaneous* spacetime domain $\partial(\mathbf{r}, \eta_\triangle, t)$. The value of the time-parameter $t = t_1$ which labels this domain is by construction *independent* of the index g that distinguishes from one another the different transfer-aspects g, $\langle g\rangle \in \langle T\rangle$. This is so because $t = t_1$ is constructed *anterior* to all the epochs $t(g)$ at which emerge, on the devices for measurements of the values gk of the aspects g, the transferred values gk which define the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$: for each examination $\langle g\rangle \eta_\triangle \in \langle T\rangle \eta_\triangle$, $g = 1, 2,..., m$ from a sequence $[\triangle R \rightarrow \eta_\triangle, \langle T\rangle \eta_\triangle]$ which leads to the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$, the measurement interaction between $\eta_\triangle$ and the device for measuring the values gk of an aspect g *begins* at an initial moment $t = t_1$ which is always the *same*, the *origin* of the transfer-durations, identically redefined for each examination (Fig. 1). And *AFTERWARDS* (in order to exist) this interaction consummates some nonzero duration $[t(g) - t_1] \neq 0$ which *varies* from one examination $\langle g\rangle \in \langle T\rangle$ to another one. This uniqueness of the temporal qualification of the domain $\partial(\mathbf{r}, \eta_\triangle, t)$, though only of the *beginning* of the process of transfer, and only *retroactive*, suffices for permitting now to conceive of *an intrinsic time-order, of a law of intrinsic evolution underlying the transferred description* $D(\triangle, \eta_\triangle, \langle T\rangle)$. So $D(\triangle, \eta_\triangle, \langle T\rangle)$ is now "explained causally." The monologue runs as follows: "At a time $t = t_1$, *uniquely defined*, the entity $\eta_\triangle$ "possessed" on the domain $\partial(\mathbf{r}, \eta_\triangle, t)$ —*connected*—the characteristics defined by the intrinsic model $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ built by the intrinsic metaconceptualization $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle TI\rangle^{(2)})$ of the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. These characteristics were *separated* from those of any measurement device and they were *such* that *via* the examinations $\langle g\rangle \eta_\triangle \in \langle T\rangle \eta_\triangle$ they have produced the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. The scattered and mixed form of this transferred description is but the result of a bursting, of a pulverization of the intrinsic an *integrated* form $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ of the entity $\eta_\triangle$. A pulverization produced by the transferring examinations $[\langle g\rangle \eta_\triangle] \in [\langle T\rangle \eta_\triangle]$. These, because of the mutual spacetime incompatibility of certain examinations $\langle g\rangle \eta_\triangle$, $\langle g\rangle \in \langle T\rangle$, have obliged us to perform several different sequences $\triangle R \rightarrow \eta_\triangle$, $\langle g\rangle \eta_\triangle$ in order to obtain the transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. We succeeded to mirror, so feebly, the intrinsic oneness of the own time of the entity $\eta_\triangle$ by reconstructing for these different examinations $\langle g\rangle \eta_\triangle$, on a statistical level, only a "common" origin $t = t_1$ of the transfer durations $[t(g) - t_1]$ (the final moment of the respective delimitations $\triangle R \rightarrow \eta_\triangle$). But the intrinsic metaconceptualization $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ permits now to perceive fully the unique well ordered time of the entity $\eta_\triangle$." In short, the intrinsic model $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ corresponding to a transferred individual description is an invariant *construct* with respect to the various sorts of measurement-transformations $\langle g\rangle \eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \langle g\rangle)$, $\forall \langle g\rangle \in \langle T\rangle$ involved by a transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$. A construct which unifies all these transformations by "chunking" them together.

This construct $D^{(2)}(\triangle, \eta_\triangle, \langle I\rangle^{(2)})$ marks a position of saturation and of equilibrium of the significance assigned to the tentative initial label $\eta_\triangle$. It makes us feel that we finally "understand" what the label $\eta_\triangle$ "means." It sets an economic and stable closure upon the representation of what has been *a priori* called the entity $\eta_\triangle$. This closure is perceived as satisfactory and as necessary to such a degree that its character, *ineluctably hypothetic*, *retroactive, and RELATIVE to an initial transferred description and to a*

PARTICULAR intrinsic metaview (no doubt admitting for a whole class of substitutions), tends to be skipped. The unavoidable initial phases of transferred description have always been left inexplicit and *a fortiori* unformalized to the maximal degree possible. Starting from the transferred data that are available for it and on which it takes support without trying to express them, the human mind always rushes as rapidly and as directly as it can toward a representation by an intrinsic model. As soon as such a representation has been attained it is spontaneously felt to be "true," in an absolute and certain way, without reference to the transferred data on which it is founded and remaining unaware that it is JUST AN ECONOMIC CONSTRUCT. While these initial transferred data, which in fact are the sole certitudes, are spontaneously felt to be nothing more than "subjective" tools for finding the intrinsic truths. Adjuvants of which it is useless to specify the organization because they are devoid of "objective" meaning. Just scaffolds to be destroyed in order to clean up the work accomplished with their help: the "objective" intrinsic model $D^{(2)}(\triangle, \eta_{\triangle}, \langle 1 \rangle^{(2)})$ of the entity $\eta_{\triangle}$, finally freed of any dependence on "subjective" informations. The *aim* of the conceptualization. Irrepressibly, we commit what Firth[9] (p. 100) called "the fallacy of conceptual retrojection." We commit it because we are moved by an irrepressible need of representations admitting of connex spacetime supports, of a unique ("causal") temporal order for each "entity" $\eta_{\triangle}$, tied to a continuous domain of space. Such is our mind. (Even here, inside the present development, when I introduced the crucial notion of a purely physical delimitator $\triangle$ which by the operations $\triangle R \rightarrow \eta_{\triangle}$ introduces entities $\eta_{\triangle}$ that are physically determined, but as yet unknown "potentialities" of subsequent qualifications, *I cut out in advance a void conceptual volume for future intrinsic metaconceptualizations*!). We cannot escape this tendency. *Nor should we.* But it is useful to know how we work.

These features of the cognitive psychology manifest themselves throughout classical physics. The Newtonian mechanics, the electromagnetism of Faraday and Maxwell, have fixed in absolute formalisms *exclusively* the intrinsic models obtained by more or less implicit metaconceptualizations of transferred initial data. The Einsteinian revolution has consisted precisely in the fact that, for the *particular* entities studied by classical mechanics and electromagnetism

— it has brought into evidence the illusory character of these absolutizations; the UNAVOIDABLE existence of an initial phase of description of the studied entities that is generated by transfer-views

— it has explicated the structure of the relativities to these initial transfer-views

— it has identified the consequences of these relativities, upon an "optimized" subsequent intrinsic metaconceptualization where are deliberately *constructed* invariants *with respect* to the initial transferred data.

But the Einsteinian revolution has been accomplished *against* the thrusts of the mind, under the irresistible pressure of the conceptual difficulties generated by the false absolutizations of the too hasty intrinsic descriptions from the classical physics. The results brought forth so far by the method developed here bring into evidence that Einstein's approach bears—specifically—only on certain *particular* manifestations of a quite *general* epistemic fact: *all the intrinsic aspects from any intrinsic metaconceptualization concerning any entity $\eta_{\triangle}$, are essentially relative to some initial transferred description.* Then *all* these relativities must *always* be explicitly stated and their consequences on a subsequent intrinsic metaconceptualization have to be systematically optimized by the help of criteria leading to the construction of most economic invariants. The problem of truth is another question.

4. MINIMAL REALISM

The concept of intrinsic metaconceptualization unavoidably leads to the fundamental question of realism: What is the relation between an "intrinsic" metaconceptualization of the designatum of the locution "the entity $\eta_{\triangle}$," and the existence "in itself" (*per se*) of this designatum? One might believe that, since Kant's combat, it has become trivial to still examine such a question. However the nowadays attitudes concerning realism are so various that it seems important to declare explicitly my personal position, which underlies the whole approach developed here. I practice the following

Postulate of "Minimal" Realism. I postulate the existence —*exclusively* the existence otherwise strictly non qualified—of *a potentiality independent of any observer and of any act of observation or of conceptualization*, that qualifications shall emerge *if* some observer accomplishes appropriate epistemic actions. This is what I call "reality in itself."

So I postulate the existence of something admitting exclusively the qualification of being qualifi*able*, independently of the fact whether yes or not qualifiers do exist and do act. Which is equivalent to a *pure* negation of solipsism, *nothing more*. Just a credo that "knowledge" is not generated by mind alone, that it is also tied with some substratum wherefrom mind stems and with which it interacts. Realism, I think, cannot be reduced to still less.

Consider now the concept of intrinsic metaconceptualization. It has been defined here as a particular type of relative description which, quite obviously, is radically *different* from "reality in itself" as defined above. Indeed any intrinsic metaconceptualization, by construction, *specifies* qualifications of some intrinsic model. It specifies some intrinsic *mode* of existence which, in its turn, is *essentially* relative to some preceding transferred description bringing in other, previous specifications of some other (transferred) *modes* of existence. All these qualifications of ways of existing depend on the observer's perceptions, on his biological "views" (nervous terminals) and on his instruments. All these qualifications simply do *not reach*, they cannot touch what has been called here "reality in itself": a bare existence of a *potentiality* for qualifications, strictly non actualized, so *independent* of any act of observation, of any observer. It is most important to realize clearly and strongly this fact—at the same time trivial and evasive—that the notion of "a *MODE* of existence of reality *in itself*, i.e., independently of any act of observation, is *self-contradictory*. That it is a nonsense, an impossible notion.

It might seem that our definitions are too severely restrictive, that it is possible to win one more inch of conceptualization by specifying explicitly that the reality in itself has to be conceived "such" that the qualifications which it does accept from our part be precisely those which are elaborated with our senses, by our investigations and our minds. But inside the epistemic syntax elaborated here this last step would be illicit. It appears as an inertial attempt at an ultimate intrinsic metaconceptualization that cannot be achieved: that one which would introduce the limiting intrinsic metaview $\langle \mathrm{T} \rangle^{(2)}$ consisting of the unique intrinsic aspect $g =$ "such that ..." just spelled out, and the limiting entity $\eta_{\triangle} =$ "reality in itself" *as a whole*. But the object of such an intrinsic metaconceptualization simply cannot be produced, it cannot be made available. The object of an intrinsic metaconceptualization is, by definition, *a previously achieved transferred description* $D(\triangle, \eta_{\triangle}, \langle \mathrm{T} \rangle)$ *of the entity* $\eta_{\triangle}$ *produced by a basic delimitator* $\triangle$. But for "reality in itself" as a whole a transferred description is impossible. It escapes the realm of the human epistemic actions because we can only produce an infinity of parcelling delimitations on which we found parceled knowledges. Never the total delimitation of the "reality in itself" as a whole. For this we would have to somehow lie outside "reality in itself" and encompass it. So just the direct independent postulation of an indeed *strictly* non qualified existence of what we can call "reality in itself" is the very last step that we can *consistently* add to the relativizing epistemic syntax constructed here. This step brings us upon the extreme boundary between the universe of the qualifications which specify modes of existence and the universe of the existent *in itself*, independently of any act of observation or further conceptualization. This boundary marks a solution of continuity with respect to knowledge. An abrupt, radical and impassable barrier which installs a separation that admits no sort of *dosage*, no specification of some "degree of contiguity," no nuance whatever expressible in terms of "approximations" or of "asymptotic" apprehensions. Any progressive approximation is imprisoned inside the realm of the qualified. It hits the frontiers of this realm *from inside*; telling nothing about the "distance" between this frontier and the strictly unqualified "reality in itself." The language posited here marks deliberately this ultimate frontier, in order to materialize the limits of our mind so that we shall be able to perceive them clearly. If we ignore them the contours of realism remain fuzzy. Then the concept cannot resist the inertial trends toward an impossible transcendence, and it becomes a germ of false hopes, false problems, and paradoxes. Of just disordered convulsions.

The realist must psychoanalyse himself and surprise his implicit and vacillating inconsequences with respect to his most fundamental choices. For these inconsequences do exist. It is possible to retrace the fallacious movements by which they form impossible descriptional aims, factitious problems, or, at the opposite pole, *positivistic interdictions which SUPERFLUOUSLY banish the intrinsic metaconceptualizations because they confuse them with qualifications of the reality in itself.* This non necessary exclusion amputates the liberty and the efficiency of the epistemic actions installing long periods of stagnation of thought. All this mythical fauna which spouts from the implicit squeezings of our understanding against an ill perceived boundary that cannot be transgressed, has to be exorcised. The realist must calmly, longly, lucidly settle his attention on this boundary. By a deep assimilation of the Kantian revolution he must become fully aware of the impossibility of the naïve hope that somehow, asymptotically, by successive approximations, the human mind might approach the "absolute" *knowledge* of the reality "such as it is in itself." And *correlatively* he should become fully aware of the fact that this does not in the least interdict, neither the rejection of solipsism, nor the boundless progression toward a more and more coherent and extended, unifying intrinsic metaconceptualization. That these are *available liberties*.

It is obvious that any question of truth or of objectivity of what I call minimal realism, is devoid of significance. We are in presence of a pure posit, of the declaration of a belief, entirely subjective, essentially non verifiable. But this posit plays a fundamental role in the method of relativized conceptualization. *It establishes the method on a unifying ground.* The minimal realist postulate asserts that beneath the endless proliferation of descriptional relativities brought in by the innumerable tree-like transfer structures from the bottom of our knowledge, there exists *a substratum of* *non referred absolute potentiality* wherefrom all these relativities emerge together with the conceptualizations. An origin which transcends the empire of relativity precisely because, as a whole, it transcends the realm of human action. This is a sort of intellectual religion, in the etymological sense of the term. The thesis of minimal realism attracts *outside* the domain of the communication languages and of the descriptions. By virtue of the mysterious power of the communication languages to exceed themselves, this thesis acts like a directional verbal indicator pointing from inside the volume of the expressed, but which points toward an "existence" exterior to this volume. It grabs the attention, displaces it, and implants it into the inaccessible to specified qualifications. At the very heart of the non expressible. There, into this substratum of non expressible which it succeeds to designate, the thesis of minimal realism infixes the loose ends of the descriptional threads: the strictly non qualified entities $\eta_\triangle$ that are the objects of the transferred descriptions $D(\triangle, \eta_\triangle, \langle \mathrm{T} \rangle)$ which form the parceling and incessantly moving prime layer of our knowledge. Thereby it weaves together the two universes that lie on the two sides of the evasive but impassable frontier between the communicably formulated, and a conceivable which is devoid of communicable expression.

It might seem that this postulated substratum of non referred, because it is posited as an absolute, is incompatible with the method of relativized conceptualization. But—and it is important to stress this—*the method of relativized conceptualization by no means banishes ANY absolute.* This would be both unrealizable and inefficient. It banishes exclusively the "false" absolutes. That is, the absolutes which hide descriptional relativities of which the presence can be identified and which, if they are ignored, can generate illusory problems. But when one constructs, it cannot be avoided to posit certain absolutes. For instance the definitions of a delimitator and of a view, or the principle of separation, obviously have nothing relative about them when they are considered, respectively, *as* definitions or *as* a principle. They are *absolutes* of the method built here, non referred elements of this method, by the *help* of which the relativities are specified. Now, concerning the concept of reality in itself as defined here no hidden relativity can be identified, because no relativity whatever can be defined for this concept: by construction the concept admits no definite qualification, while *relativities are metaqualifications.* So the thesis of minimal realism is a salubrious absolute of the method. And which possesses the conceptual power to melt into an underlying unity the ensemble of all the endlessly various relativities asserted by the method.

In my eyes, from this basic unity there emanates a beauty which, irrepressibly, appears to me as a sign of pertinence, as a sort of confirmation of the postulate of minimal realism. Man and "reality" form a non dis-

sociable whole. And the impression of beauty that can arise in a human mind, intimately tied with that of coherence, appears to me as a signal announcing that certain slopes of the real have been usefully materialized without having been violated. The sequence of words just aligned might seem to point toward an unimaginable designatum. Nevertheless I do align them, for we *must* practise *some* manner of *speaking* in order to communicate, paradoxically and in spite of all, concerning the non verbalizable.

5. RELATIVIZED PROBABILITIES, QUANTUM MECHANICS, POPPERIAN PROPENSITIES

What happens now if $D(\triangle, \eta_\triangle, \langle \mathrm{T} \rangle)$ reveals itself to be a *statistical* transferred description? What significance could be associated to the assertion that we are dealing with "*one* entity" $\eta_\triangle$, if the reiterations of the succession of epistemic operations $[\triangle R \to \eta_\triangle, \langle \mathrm{T} \rangle \eta_\triangle]$ lead to descriptions $D(\triangle, \eta_\triangle, \langle \mathrm{T} \rangle)$ that are not only transferred, but furthermore are not individual, are also *variable*, consisting exclusively of *fluctuating* ensembles of qualifications of various registering objects, all admittedly distinct from what is labeled "one entity $\eta_\triangle$"? Concerning this new complexified question, the same preliminary condition which already emerged for the simplest case, tenaciously continues to impose itself: In order to admit that what had tentatively been labeled "one entity $\eta_\triangle$" points toward a designatum which deserves being definitively denominated and installed into the conceptualization, it is *necessary* that *some* invariance shall manifest itself. Since it has not been found concerning the first descriptional level where the basic transferred description $D(\triangle, \eta_\triangle, \langle \mathrm{T} \rangle)$ is placed, this invariance can only concern either the metadescription $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle \mathrm{S} \rangle^{(2)})$ obtained on the second descriptional level, or some other metadescription of level higher than 2 and stemming from the epistemic action of the basic referential $(\triangle, \langle \mathrm{T} \rangle)$. Indeed if no sort of invariance whatever tied with the basic pairing $(\triangle, \langle \mathrm{T} \rangle)$ would ever appear, concerning none of all the descriptional levels 1, 2,..., K of a "sufficiently" long sequence of K levels, what would we say? We find out again—as one finds out that outside it rains!—that we would say that it finally became "practically" certain that the epistemic referential $(\triangle, \langle \mathrm{T} \rangle)$ is unable to "prove" the "existence" of an entity $\eta_\triangle$ which deserves being denominated and stored into the inventory of the conceptualized. *Notwithstanding* the fact that the delimitator $\triangle$ and the view $\langle \mathrm{T} \rangle$ *do* mutually exist in the sense of Eq. (9). So, definitively this time, the qualification of "descriptions connected with an entity $\eta_\triangle$" would be retired *a posteriori* to all the links of the chain of constructs $[D^{(n)}, \triangle^{(n)}, E^{(n)}, \langle \mathrm{S} \rangle^{(n)}]$, $n = 1, 2, \ldots, K$ founded on the pairing $(\triangle, \langle T \rangle)$. Once more we would admit *reflexively* that we had invested these constructs with significance only tentatively, provisionally, under the pressure of a successively shifted and deceived hope of finding on the next descriptional level an invariant permitting to associate some meaning with the label $\eta_\triangle$. An invariant announcing that the climbing from level to level in search of a definition can finally be stopped. (But notice the relativity to the basic view $\langle T \rangle$: it *still* remains possible that the association of the same delimitator $\triangle$, with some other view $\langle T \rangle' \neq \langle T \rangle$ shall reveal a meaning assignable to the label $\eta_\triangle$). This imperious requirement that some invariant shall emerge on some descriptional level of a finite order is of the same essence as the requirement of finiteness to which the concept of definition is subjected in meta-mathematics. There like here it is *necessary* to be able to found on some signal the assertion that the specification of the object to be defined, has been *achieved*. The spontaneous ways of our mind obey to algorithms.

The preceding remarks bring into evidence the crucial importance of the concept of probability. Indeed this concept—when it *can* be applied—expresses a *convergence* of each one of the dispersed relative frequencies which are involved in the definition of a statistical description. Such a convergence *would* constitute the researched invariant. A far more remote and complex invariant than the relative identities that found the concept of an individual description. But also a much less restrictive one.

At this point arises a preliminary problem. The concept of probability as it now stands lies, still nonextracted, inside a magma of false absolutes. In order to incorporate it into the method of relativized conceptualization it is necessary to detect these false absolutes and to clean them away, drawing into the explicit all the relativities involved.

5.1. The False Absolutes of the Nowadays Theory of Probabilities

The fundamental concept of the nowadays theory of probabilities (Kolmogorov's formulation) is a probability space $[U, \tau, p(\tau)]$ where: $U = \{e_i\}$ (with $i \in I$ and I an index set) is a "universe" (a set) of "elementary events" e_i; τ is an algebra of "events" (subsets of U) built on U; $p(\tau)$ is a "probability measure" defined on the algebra of events τ. The universe of elementary events $U = \{e_i\}$ is conceived of as generated by the reiteration of an "identically" reproducible procedure P, but which brings forth elementary events e_i that *vary* in general from one realization of P to another one. A pair $[P, U]$ containing an identically reproducible procedure P and the corresponding universe of elementary events U is called a random phenomenon. On a given universe U, a whole ensemble of different algebras τ of subsets of U can be defined. So it is possible to form different

"probability chains" [a random phenomenon] $\rightsquigarrow$ [a corresponding probability space], all stemming from $[P, U]$. In symbols

$$[P, U] \rightsquigarrow [U, \tau, p(\tau)]$$

However the concept of "a probability chain" is not explicitly defined. So the unavoidable association of a considered probability space, with the random phenomenon which generates it, is very rarely explicitly mentioned and surveyed. The nowadays abstract theory of probabilities is a formal system, a syntax, already remarkably precise and rich in its techniques but which is *devoid of any elaborated channels for a controlled, a regulated adduction of semantic substance from the reservoir of physical-and-conceptual reality* which in this work is indicated by the letter R. Nothing is asserted concerning the way in which the elementary events from the universe U do *operationally* emerge. The structure of what is called a reproducible procedure P is not investigated. In each application of the abstract theory of probabilities, to some specific problem, the corresponding semantic substance is injected into the formalism in an intuitively decided way, without the help of established general rules. These lacunae appear strikingly as soon as one begins to raise questions suggested by the method of relativized conceptualization:

- What is an identically reproducible procedure P? Is it exclusively an operation of delimitation, or is it some association between a delimitation and an examination by a view? It seems obvious that also some view is quite systematically involved, since it is asserted that the procedure P brings forth "different" elementary events e_i. But "different" in what sense? With respect to which view? In the absence of *any* view, the elementary events e_i cannot be perceived. They even cannot be imagined. So *a fortiori* they cannot be compared and mutually distinguished. A delimited entity on which no view acts nor has ever acted before, simply cannot penetrate into consciousness. So the index $i \in I$ necessarily refers to qualifications by values of some aspects of some view *and* these can concern only some entity $\eta_\triangle$ selected by some *delimitator*. This delimitator however, we saw, cannot—alone—yield an equivalent for what is called an identically reproducible procedure P, since this involves also some view. So of what does P consist, exactly? How can its content be fully symbolized?
- While the *unique* index i that labels the elementary events e_i is not sufficient for cutting out a conceptual receptacle able to contain the *full* specification of the qualifications of these elementary

events by a view. Even in the simplest case of a view with only one aspect, the fully structured grating (1) of possible qualifications requires already *two* indexes, the aspect-index g *and* the index k devoted to the considered value of the aspect g. *The symbolic framework necessary for the expressibility of the structure* (1) *of the involved view is not constructed.* In such conditions the *expression* of the semantic substance that can be injected into this formalism is certainly amputated *systematically*.

— Finally, consider the most fundamental question: *Beyond* its formal definition, what is the *significance* of the probability measure from a probability space? Why in certain cases the relative frequencies of the elementary events from a universe U do converge toward a corresponding probability measure, while in other cases no such convergence manifests itself? What *sort* of *entity* is indicated by the existence of a probability measure for the elementary events from a universe U?

I hold that—up to this day—the *unique* non-amputating, non-naive interpretation of the existence of a probability measure, is that one expressed by Sir Karl Popper's profound concept of "propensities." But this concept is blurred by a mist of mystery that grows out from the false absolutes which mutilate the notions of an identically reproducible procedure, an elementary event, an event. In order to become able to perceive clearly the content of the Popperian notion of propensity it is necessary to remove all these false absolutes.

5.2. Relativizations

Relativized Random Phenomenon. We are trying to express probabilistic convergences for the statistical distributions involved in a statistical transferred description $D(\triangle, \eta_\triangle, \langle T\rangle)$ of a physical entity $\eta_\triangle$. Let us first consider the simplest case, that of a basic transfer-view $\langle T\rangle = \langle g\rangle \vee \langle Ed\rangle$ which, besides the space-time frame-view $\langle Ed\rangle$, consists of only one transfer-aspect-view. (Since the frame-view $\langle Ed\rangle$ is always available by convention, often we shall not mention it).

We are at the zero-point of a chain of conceptualization: a realization of the operation $\triangle R \rightarrow \eta_\triangle$ *alone*, produces a result $\eta_\triangle$ consisting of the purely physical determination of a certain monolith of still entirely unknown (non expressed) potentialities. So in order to traverse from the realm of mute factuality into the realm of the communicable, we are obliged to consider *successions* $[\triangle R \rightarrow \eta_\triangle, \langle g\rangle\eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \langle g\rangle)]$ of the *two* epistemic operations, $\triangle R \rightarrow \eta_\triangle$ and $\langle g\rangle\eta_\triangle \rightarrow D(\triangle, \eta_\triangle, \langle g\rangle)$.

Each such—reproducible—succession entails as its final effect a (transferred) description $D(\triangle, \eta_\triangle, \langle g\rangle)$ of the entity $\eta_\triangle$. Such a description belongs now to the realm of the observed and expressed, of the communicable. Now, a transferred description $D(\triangle, \eta_\triangle, \langle g\rangle)$ consists by definition of a certain configuration of perceivable qualifications gk (values k of the transferred aspect g) appearing on the surface of the g-measuring device, hence distributed on the spacetime grating introduced by the frame-view $\langle Ed\rangle \in \langle T\rangle$. We have already introduced for such a configuration a synthetic symbol h, $h = 1, 2, \ldots, L(g)$, with $L(g)$ finite, in consequence of the finite number of the spacetime-gh qualifications permitted by definition for any view. So we write $D(\triangle, \eta_\triangle, \langle g\rangle) = \eta_{gh}$. Then the realized reproducible procedure P appears to be

$$P = [\triangle R \rightarrow \eta_\triangle, \langle g\rangle\eta_\triangle \rightarrow \eta_{gh}], \qquad h = 1, 2, \ldots, L(g), \qquad L(g) \text{ finite}$$

This writing expresses quite explicitly the very important fact that *one* realization of what is called "the reproducible procedure P", consists of the *succession* $[\triangle R \rightarrow \eta_\triangle, \langle g\rangle\eta_\triangle \rightarrow \eta_{gh}]$ of *two* epistemic operations (supposed here to be both of a purely physical nature):

— an operation of delimitation $\triangle R \rightarrow \eta_\triangle$ of an entity labeled "$\eta_\triangle$" (in consequence of the purely physical character assumed here for the delimitator $\triangle$ this entity, still strictly non described, can even *entirely* escape, not only human perception, but also direct human *perceptibility*, as it does happen indeed in microphysics)

— an examination of the entity $\eta_\triangle$ *via* the transfer-view $\langle T\rangle = \langle g\rangle \vee \langle Ed\rangle$ (for the sake of simplicity we write $\langle g\rangle\eta_\triangle \rightarrow \eta_{gh}$)

The final effect being systematically a relative, observable, transferred description $D(\triangle, \eta_\triangle, \langle g\rangle)$ renoted $D(\triangle, \eta_\triangle, \langle g\rangle) = \eta_{gh}$, with $h = 1, 2, \ldots, L(g)$.

If, as it is here supposed, the relative description $\eta_{gh} = D(\triangle, \eta_\triangle, \langle g\rangle)$ is *not* individual (for instance because the extension of the spacetime domain where the entity $\eta_\triangle$ can produce observable transferred effects is larger than the spacetime domain that can be covered by only one act of examination *via* the transfer-view $\langle T\rangle = \langle g\rangle \vee \langle Ed\rangle$), then a sufficiently large number N of reiterations $P_j = [\triangle R \rightarrow \eta_\triangle, \langle g\rangle\eta_\triangle \rightarrow \eta_{gh}]_j$, $j = 1, 2, \ldots, N$, of the procedure P (j: index of reiteration) can produce any one from the ensemble of possible distinct groups of qualifications η_{gh}, $h = 1, 2, \ldots, L(g)$, $L(g)$ finite. So the translation in our terms of the universe of elementary events $U = \{e_i, i = 1, 2, \ldots, \lambda\}$ is

$$U = \{D(\triangle, \eta_\triangle, \langle g\rangle) = \eta_{gh}, h = 1, 2, \ldots, L(g)\}$$

Notice that by the application of our method the semantically insufficient one-index differentiation of the elementary events practiced in the nowadays theory of probabilities, has "automatically" transmuted into a *double* indexation of the elementary events, by g *and* h, permitting to distinguish hierarchically between aspect and values of aspect.

So the relativized reformulation of the fundamental concept of a random phenomenon can be symbolized by the new writing

$$(P, U) \tag{11}$$
$$= (\{[\triangle R \to \eta_\triangle,\ \langle g\rangle\ \eta_\triangle \to \eta_{gh}]_j,\ j = 1, 2,..., N\},\ \{\eta_{gh},\ h = 1, 2,..., L(g)\})$$

In this writing, the *operational* structure of the concept of a random phenomenon is entirely explicated and symbolized. *The channels for the adduction of semantic substance, from the reservoir of "reality" denoted R, into a probability space, are now represented.*

Relativized Probabilizable Chain. Let us define on the universe of elementary events $U = \{\eta_{gh}\}$ from Eq. (11), the *total* algebra on $U = \{\eta_{gh}\}$. Let us denote this algebra by τ_g and let us call it the *algebra of g-events for* $\eta_\triangle$. The algebra τ_g contains all the unions of elementary events from U, all the intersections of such unions, U itself, and the void ensemble. So it contains *meta*-descriptions with respect to the descriptions η_{gh} from the universe U. Globally, this reservoir of relative metadescriptions is the boolean algebra of relative descriptions generated by the elementary descriptions η_{gh}. We are now in presence of a *relativized probabilizable chain*:

$$[\{[\triangle R \to \eta_\triangle,\ \langle g\rangle \eta_\triangle \to \eta_{gh}]_j,\ j = 1, 2,..., N\},\ \{\eta_{gh},\ h = 1, 2,..., L(g)\}]$$
$$\to [\{\eta_{gh}\}, \tau_g] \tag{12}$$

The chain (12) and the random phenomenon (11) are connected with a probabilizable space in the standard sense of the term. But in contradistinction to what happens in the nowadays theory of probabilities the relativized reformulation of Eq. (12) involves an explicitly worked out, detailed and symbolized operational definition of the *very complex* relations between the probabilizable space $[\{\eta_{gh}\}, \tau_g]$ and the random phenomenon (11) which produces it. It goes down into the substrata of the conceptualization, throwing light on the genetic role played by the basic epistemic referential $(\triangle, \langle g\rangle)$ that is at work.

Relativized Probability Spaces. We define:

Probabilization with Respect to One Aspect. Consider the chain (12) belonging to a (relative, transferred) statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$. Select the g-population view $\langle ng\rangle^{(2)}$ from $\langle S\rangle^{(2)}$ (each value of the corresponding g-population aspect being the relative frequency $n(gh)/N$ of realization of an event η_{gh} from Eq. (12)). Let $p(\tau_g)$ be a probability measure asserted on τ_g, computed, on the basis of the law of total probabilities, from an elementary probability measure, SUPPOSED TO EXIST, defined on the universe of elementary events U. Namely

$$p(gh) = \lim(N \to \infty)[n(gh)/N], \qquad h = 1, 2,..., L(g) \tag{13}$$

The chain

$$[\{[\triangle R \to \eta_\triangle,\ \langle g\rangle \eta_\triangle \to \eta_{gh}]_j,\ j = 1, 2,..., N\},\ \{\eta_{gh},\ h = 1, 2,..., L(g)\}]$$
$$\to [\{\eta_{gh}\}, \tau_g, p(\tau_g)] \tag{14}$$

will be denominated "the probabilization with respect to the aspect-view $\langle g\rangle$ of the statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$" or "the probabilistic description founded on the basic epistemic referential $(\triangle, \langle g\rangle)$" (with $\langle g\rangle \in \langle T\rangle$) and it will be symbolized by the writing $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle Pg\rangle^{(3)})$, with:

> $\langle Pg\rangle^{(3)}$: the meta-metaview of probability relative to the aspect-view $\langle g\rangle$ possessing by definition the structure $\langle Pg\rangle^{(3)} = \langle Sg\rangle^{(2)} \vee \langle Cg\rangle^{(3)} = \langle g\rangle \vee \langle ng\rangle^{(2)} \vee \langle Cg\rangle^{(3)}$, with $\langle Cg\rangle^{(3)}$: the meta-meta-view of g-convergence, the values of the corresponding g-convergence aspect being by definition the limiting values $p(gh)$ defined by Eq. (13) for the populations $n(gh)/N$.

So following the commands of the principle of separation, we have reached a new descriptional level, the third one with respect to the initial description $D(\triangle, \eta_\triangle, \langle g\rangle)$. For any fixed number N of reiterations of the initial description $D(\triangle, \eta_\triangle, \langle g\rangle)$, this third level of conceptualization involves *furthermore*: (a) a very big number N', $N' \neq N$, of reiterations, now, of "the" measurement of the *ensemble* of *all* the relative frequencies $n(gh)/N$, $h = 1, 2,..., L(g)$, (constituting *together* "one" measurement of the whole statistical *distribution* $\{n(gh)/N,\ h = 1, 2,..., L(g)\}$, considered *globally*; (b) comparison of the result of each measurement of the whole statistical distribution $\{n(gh)/N,\ h = 1, 2,..., L(g)\}$, with the assertion of Eq. (13) of convergence. However in consequence of the FINITENESS of any realizable pair N, N', no matter how large N and N' are and WHATEVER are the results of the N' successive comparisons with the presupposed limits $p(gh)$ from Eq. (13), this presupposition remains NON REMOVABLY subject to a possible *a posteriori* "invalidation." While such an invalidation, in its turn, equally remains non removably uncertain.

Nevertheless, if on this third descriptional level an *a posteriori* invalidation of the presupposed convergence by Eq. (13) would emerge *with respect* to some precision ∂, arbitrary but chosen in advance, and for some given pair of "sufficiently" big numbers N and N', arbitrary but chosen in advance, then I *decide* that I would *conventionally*, *strategically*, close the exploration by a *relativized exclusion*, saying that the epistemic referential $(\triangle, \langle g \rangle)$ is rejected because finally it has been found to be "(∂, N, N')-nonsignificant" with respect to the aspect g. Notwithstanding the fact that it had resisted elimination by the initial much more fundamental test of relative existence (7). This is consistent with the general attitude of *a priori* confidence and *a posteriori* back-control, and of systematic finitism, practiced in this approach. Moreover a decision of *a posteriori* elimination of the type specified here constitutes *a relativized application of the requirement of finiteness imposed in meta-mathematics upon any definition*: the epistemic referential $(\triangle, \langle g \rangle)$ is "(∂, N, N')-banished" when the entity $\eta_\triangle$ produced by the delimitator $\triangle$ does not admit, *via* the view $\langle g \rangle$, a definition *bounded* by the trio of numbers (∂, N, N'), arbitrary but chosen in advance. Such a "(∂, N, N')-banishment" would play the role of a *relative proof of inexistence* of an interpretation for the transferred relative description $D(\triangle, \eta_\triangle, \langle g \rangle)$.

But suppose now that, on the contrary, the *a priori* asserted convergence (13) appears to be "(∂, N, N')-confirmed" *a posteriori*, i.e., the statistical distribution $\{n(gh)/N,\ h = 1, 2,..., L(g)\}$ is found to be "(∂, N, N')-identical" to the posited probability law $\{p(gh),\ h = 1, 2,..., L(g)\}$. In this case—again *conventionally*, *strategically*—I *decide* to consider that the probability measure $p(\tau_g)$ from Eq. (13), hence the probabilization (14), are "(∂, N, N')-true" and that the epistemic referential $(\triangle, \langle g \rangle)$ is "(∂, N, N')-significant." This decision however would be just a STRATEGIC BET. A bet expressed mathematically by what in the theory of probabilities is called the weak law of big numbers. Only on the basis of this bet is it possible to *quit* the domain of factual statements and statistical countings, and to penetrate, with *non* individual descriptions, into the domain of "certitude," of deduction. *This bet can be regarded as an application of what is called "the principle of induction,"* to the case of N' reiterations of the observation [the statistical distribution $\{n(gh)/N,\ h = 1, 2,..., L(g)\}$, is "$(\partial, N, N')$-identical" to the probability law $\{p(gh),\ h = 1, 2,..., L(g)\}$]. This application draws out the frontier, but a hierarchically *connecting* frontier, between probabilities and logic: It permits *deductions* leading to certain conclusions concerning probabilistic hypotheses. (This indicates the framework for a relativized unification of logic and probabilities).

Consider now a branch b of the statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S \rangle^{(2)})$. The possible values of the branch-view $\langle b \rangle$ are by definition associations between a combination of values gk of various mutually compatible aspects g from the transfer view $\langle T \rangle$, with values $\mathbf{r}t$ of the spacetime frame-aspect involved by $\langle T \rangle$. And every examination $\langle b \rangle \eta_\triangle$ leads to a partial description consisting of a certain configuration of such associations. The description $D(\triangle, \eta_\triangle, \langle b \rangle)$ can be regarded as a "logical intersection," as a simultaneous realization of several descriptions $D(\triangle, \eta_\triangle, \langle g \rangle)$, $\langle g \rangle \in \langle T \rangle$. Hence it is a *meta*-description with respect to the descriptions $D(\triangle, \eta_\triangle, \langle g \rangle)$ considered separately. Let us make use again of the global index h for a configuration of values gk, $\mathbf{r}t$, $\forall \langle g \rangle \in \langle b \rangle$, constituting a description $D(\triangle, \eta_\triangle, \langle b \rangle)$. This index can *a priori* assume a whole ensemble of different values, $h = 1, 2,..., L(b)$ of which the cardinal $L(b) \geq L(g)$ depends now on the structure of the whole branch-view $\langle b \rangle$. Consider the b-statistical metaview $\langle nb \rangle^{(2)} \in \langle S \rangle^{(2)}$ corresponding to the whole branch-view $\langle b \rangle \subset \langle T \rangle$. By definition, this metaview possesses the structure $\langle nb \rangle^{(2)} = \bigvee_g \langle g \rangle$, $\forall \langle g \rangle \in \langle b \rangle$ and the values of the corresponding aspect b are the relative frequencies $n(bh)/N$, $h = 1, 2,..., L(b)$ of realization of the different configurations of values gk, $\mathbf{r}t$, $\forall \langle g \rangle \in \langle b \rangle$ globally labeled by h, $h = 1, 2,..., L(b)$ (the relative frequencies of realization of the different possible partial descriptions $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle b \rangle^{(2)})$). We define:

Probabilization of a Branch. Consider a (relative, transferred) statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S \rangle^{(2)})$. Select the b-statistical metaview $\langle Sb \rangle^{(2)} \in \langle S \rangle^{(2)}$ corresponding to the whole-branch-view $\langle b \rangle \subset \langle T \rangle$. This corresponds to a b-population view that introduces a b-population aspect with values the relative frequencies $n(bh)/N$ of realization of the branch-descriptions $D(\triangle, \eta_\triangle, \langle b \rangle)$. Let $p(\tau_b)$ be a probability measure on τ_b computed, *via* the law of total probabilities, from the elementary probability law—*supposed to exist*—

$$p(bh) = \lim(N \to \infty)[n(bh)/N], \qquad h = 1, 2,..., L(b) \tag{13'}$$

The chain

$$[\{[\triangle R \to \eta_\triangle, \langle b \rangle \eta_\triangle \to \eta_{bh}]_j, j = 1, 2,..., N\}, \{\eta_{bh}, h = 1, 2,..., L(b)\}] \to [\{\eta_{bh}\}, \tau_b, p(\tau_b)] \tag{14'}$$

will be called the "probabilization of the statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S \rangle^{(2)})$ with respect to the branch-view $\langle b \rangle$" or the probability-chain founded on the basic epistemic referential $(\triangle, \langle b \rangle)$," $\langle b \rangle \subset \langle T \rangle$. This same probability-chain will be also symbolized by the more compact writing $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle Pb \rangle^{(3)})$ where $\langle Pb \rangle^{(3)}$ is the "meta-metaview of probability relative to the branch-view $\langle b \rangle$" of which the structure is by definition

$\langle Pb\rangle^{(3)} = \bigvee_g \langle Pg\rangle^{(3)}$, $\forall \langle g\rangle \in \langle b\rangle$, with ($\langle Pg\rangle^{(3)}$: the meta-metaview of probability relative to the aspect g, already defined for the chain (14)).

The algebra of events τ_b from Eq. (14′) is still a boolean algebra of relative descriptions, like that from Eq. (14). All the remarks made concerning the significance of the assertion of a probability measure $p(gh)$ concerning only one aspect-view $\langle g\rangle$, hold, *mutatis mutandis*, concerning the assertion of a probability measure $p(bh)$.

Finally consider *all* the aspects from the basic view $\langle T\rangle$ involved in the epistemic referential $(\triangle, \langle T\rangle)$ on which is founded the statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$. The preceding definitions of a probabilization of this description with respect to one aspect-view or with respect to one branch-view admit the following development relative to the entire view $\langle T\rangle$.

Complete Probabilization. Consider a (relative, transferred) statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$. Consider the ensemble of all the probabilizations (14′) of this description with respect to all the $l \leqslant m$ mutually incompatible branch-views $\langle b\rangle \subset \langle T\rangle$. This ensemble will be called the "probabilistic description of the entity $\eta_\triangle$ with respect to the transfer-view $\langle T\rangle$" and it will be symbolized by the writing $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle P\rangle^{(3)})$, where $\langle P\rangle^{(3)}$ is the meta-metaview of probability relative to the whole transfer-view $\langle T\rangle$ possessing the structure:

$$\langle P\rangle^{(3)} = \bigvee_g \langle Pg\rangle^{(3)} = \bigvee_g [\langle g\rangle \vee \langle S\rangle^{(2)} \vee \langle Cg\rangle^{(3)}] \text{ with } g = 1, 2, \ldots, m$$

The preceding definition unites into one single concept the ensemble of all the probability-chains of type (14) or (14′) stemming from one same delimitator. But it is essential to be clearly aware of the fact that the similitudes which tie to one another like a leit-motif the verbal expressions of the concepts of probabilization relatively to one aspect-view, to a branch-view, or to a complete transfer-view, emerge on a ascending spiral of conceptualization. *Each level introduces its specificities* and some of these can be quite radically innovating. For instance, the final level (the 5th one already) introduces an essentially new logico-algebraic structure: The algebra of events (relative descriptions) involved in a complete probabilization of a statistical description is a union of the mutually *incompatible* algebras from the different branch-probabilizations, so a *non* boolean algebra of relative descriptions. But there appear also other specificities when one passes from one level of relative probabilization, to another one. In the Section 6 we shall produce a striking example. We will first discuss the spacetime structure of a complete probabilization.

5.3. The Spacetime Structure of a Probabilistic Description. The Descriptional Status of Quantum Mechanics

The Transfer-Tree of a Probabilistic Transferred Description. We examine now the spacetime structure of a probabilistic description $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle P\rangle^{(3)})$. This will bring into evidence that, surreptitiously, the relativizations progressively introduced have carried us radically *beyond* the frontiers of the nowadays calculus of probabilities.

The probabilistic description $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle P\rangle^{(3)})$ (Fig. 3) inherits of the tree-like spacetime structure of the corresponding statistical description $D^{(2)}(\triangle^{(2)}, E^{(2)}, \langle S\rangle^{(2)})$ (Fig. 2). But there exists an essential difference: At the top of a branch of the probabilistic description $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle P\rangle^{(3)})$, instead of the partial statistical metadescription generated by the corresponding branch-view, stays the probabilization $D^{(3)}(\triangle^{(3)}, E^{(3)}, \langle Pb\rangle^{(3)})$: *The branches of the transfer-tree have grown a peg higher, they have reached a subsequent level of conceptualization.* So we are in presence of a new structure. We call it "the probability-tree of a transferred probabilistic description," in short, "the probability tree of the basic epistemic referential $(\triangle, \langle T\rangle)$."

Notice that, in the last case mentioned in the caption of the Fig. 3, notwithstanding the complete resorption of the statistical character, so also of its probabilistic character, the tree-like character of the spacetime structure of the description *subsists*: The tree-like spacetime structure of a transferred description is tied with—exclusively—the existence, in the acting view, of incompatible transfer-aspects. *This tree-like spacetime structure is a UNIVERSAL feature of the initial transferred phase of any description. It marks universally the unavoidably existing phase of description which precedes an intrinsic conceptualization, no matter whether it is individual, statistical, or probabilistic.* It marks any description which concerns a still strictly non-interpreted but physically delimited monolith of potentialities, *a priori* just labeled (here by $\eta_\triangle$) in order to be able to think and to speak of it, but as yet entirely unknown. This tree-like spacetime structure explicates the *genesis* of the fact that the form corresponding to a transferred description is non-connected as soon as the acting view involves mutually incompatible aspects.

Consider now the most general type of probability tree that can be generated by an epistemic referential. In this case the tree contains *several* random phenomena (11) tied to one another by *one* same operation of delimitation $\triangle R \rightarrow \eta_\triangle$ which produces the trunk of the tree, but corresponding to different branch-views $\langle b\rangle$. These *l distinct* but *related* random phenomena generate *l* probability spaces which in their turn are *related* eventhough *distinct*. In these conditions the algebra of events from the

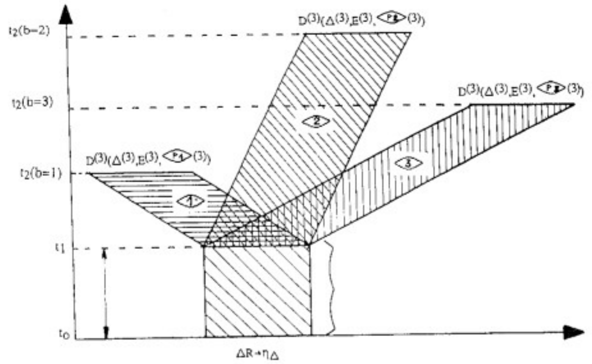

Fig. 3. The probability tree of a basic epistemic referential (△, ⟨T⟩). Let us examine all the possible sorts of probability trees. In the most general case the probability tree of an epistemic referential (△, ⟨T⟩) possesses a certain number of distinct branches, finite and bigger than 1. Each branch is generated by a branch-view ⟨b⟩ that contains a certain number bigger than 1 of mutually compatible aspect-views ⟨g⟩ ∈ ⟨T⟩ leading to a common probabilized space of the type contained in the chain (14′), located at the top of this branch. This most general case contains as particular cases *all* the types of relative description discerned before. Indeed: To begin with, the probability tree of the basic epistemic referential contains by construction the corresponding statistical description $D^{(2)}$. The other sorts of descriptions are reobtained as follows. If all the aspect-views ⟨g⟩ ∈ ⟨T⟩ from the basic view ⟨T⟩ are compatible, the probability tree possesses a unique branch introducing at its top a unique probability space of type (14′). If moreover this unique space of type (14′) contains a probability measure which is a dispersion-free Dirac-measure, the space of type (14′) at the top of the tree reduces to an *individual* transferred description $D(\triangle, \eta_\triangle,$ ⟨b⟩$)$ relative to *several* (compatible) aspects: ⟨b⟩ is a genotypical branch-view with respect to △. If the branch-view from the unique branch of the tree contains only one aspect-view ⟨g⟩, but the probability measure from the corresponding chain is *not* devoid of dispersion, the unique space of type (14′) from the top of the tree reduces to a probabilization of the type (14). If furthermore this unique chain of type (14) contains a dispersion-free probability measure, the corresponding space of type (14) reduces to an *individual* transferred description $D(\triangle, \eta_\triangle,$ ⟨g⟩$)$ relative to a *unique* aspect g. Finally, if the tree contains *several* branches $b = 1, 2, \ldots, l$, but at the top of *each* branch the corresponding probability chain contains a dispersion-free measure, all the spaces of type (14′) involved by the tree reduce to individual branch-descriptions $D(\triangle, \eta_\triangle,$ ⟨b⟩$)$, $b = 1, 2, \ldots, l$. Then the whole tree represents an *individual* transferred description $D(\triangle, \eta_\triangle,$ ⟨T⟩$)$: ⟨T⟩ is a genotypical transfer-view with respect to △.

whole tree is the *non* boolean union $\tau_h = \bigcup_b \tau_b$, $b = 1, 2, \ldots, l$ of the l boolean mutually incompatible branch-algebras τ_b. The distributivity with respect to the operations of union and intersection in the sense of the theory of ensembles, is *not* realized inside such a union. So we are in presence of an algebra of events which is *non* boolean *and* is *probabilized.* Indeed we are compelled to use *singular* terms concerning this algebra and its probabilization. We must speak of *one* probabilization of *one* algebra, notwithstanding the fact that this probabilization has been achieved by the help of a whole *ensemble* of $l > 1$ distinct probability measures contained in $l > 1$ distinct probability spaces. This necessity is entailed by the fact that the probability measures from these l distinct probability spaces are certainly *not* "independent." They stem all from one *same* operation of delimitation $\triangle R \to \eta_\triangle$, so they concern all "one" *same* entity $\eta_\triangle$. However the relation between the different probability measures from the different branches of a probability tree *transcends* the control of what, in the nowadays theory of probabilities, is called "probabilistic dependence": This is defined *only* inside a unique probability space, namely between *events.* While here we are in presence of a *new* type of probabilistic dependence. A meta probabilistic dependence which cannot be defined inside a unique probability space because it concerns *whole probability measures from distinct and mutually incompatible probability spaces*, but concerning one same entity $\eta_\triangle$. This new sort of metaprobabilistic dependence calls for a new type of *expression.* For instance an expression achieved *via* the statement of certain "laws of passage" from the probability measure contained in one branch of the tree, to the probability measure contained in any other branch of the same tree, each such law of passage being relative to the one delimitator △ involved by the tree, *and* to the pair of two distinct branch-views involved. As announced, the systematic reference to all the epistemic operations involved in a relativized reconstruction of a probabilistic description, has surreptitiously drawn us *outside* the domain of the nowadays theory of probabilities. This reference entails an extension of the theory of probabilities as it now stands.

The tree-like spacetime structure identified above is involved in *any* probabilistic description, accomplished or conceivable. Nevertheless it has remained hidden. Only by the use of epistemic operators of delimitation and of examination defined as mutually *independent* operations has it been possible to bring it into explicit evidence. It is the requirement of independence of the operation of delimitation, with respect to any eventual subsequent examination, that has permitted to introduce a "fragment of reality" labeled $\eta_\triangle \leftarrow \triangle R$ by a "definition" which is strictly a-descriptional, a-conceptual. To introduce it "blindly" from the point of view of knowledge. By an action that creates it as a monolith of entirely non described but *physically well-determined potentialities*, and, as such, captures it—in a *reproducible* way—, thus making it available for *absolutely whatever* future examinations. So also, possibly, for *incompatible* future examinations which *split* the actualized descendence of this monolith of potentialities, into a branching of incompatible descriptions, generating a tree-like potential-actualization-actualized structure. All this, without requiring the false absolute which consists in prejudging concerning the "individuality" or the "statisticity" of the entity labeled $\eta_{\triangle} \leftarrow \triangle R$, with respect to views that are not yet specified.

The Descriptional Status of Quantum Mechanics. It jumps out at one's eyes that, up to mere notations, the space-time tree-like structure of a relative probabilistic description is that of the quantum mechanical probability tree of an operation of preparation, identified in the first part of this work.[1] So, *without* being explicitly perceived in an integrated way, this very fundamental structure has been nevertheless represented *mathematically* inside the quantum mechanical formalism. This entails at least two important conclusions.

— Quantum mechanics has captured and formalized—for a particular class for physical entities, but by complex *mathematical* methods—a *universal* phase of the processes of conceptualization. The *most* basic one in fact, the phase of extraction from the still strictly unknown, and of very first passage into the perceived and qualified. This is what confers indeed to quantum mechanics this basic significance that we obscurely perceive in it. And this, once it is explicitly recognized, *opens up vistas toward a general* mathematically *expressed epistemic syntax.*

— The descriptional status of quantum mechanics acquires a clear location inside the typology of relative descriptions: Quantum mechanics is a *transferred* probabilitistic theory. Thereby it is *maximally* tied to the observer, it exposes *exclusively* the genetic ties between the observer's epistemic operations and the direct results of these; the subsequent construction of an intrinsic model that hides, effaces these genetic ties *a posteriori*, that cuts out from the representation this sort of umbilical cord, is still absent in the quantum theory as it now stands. A successful intrinsic metaconceptualization would eliminate these genetic ties, but *only* from the explicit representation where it would instead introduce descriptions relative to the utilized intrinsic metaview. In its substrata however, any future intrinsic metaconceptualization of the quantum theory would non removably remain *relative* to the transfer-views that act inside the nowadays quantum mechanical formalism.

5.4. Probability Measures, Relative Metaforms, Popperian Propensities

We come now to the central question: What is the meaning of the hypothesis that the probability measure (13) or (13′) exists? We begin by examples.

Take a replica of the Joconda picture. Cover it by a 10×10 squaring, like in the Fig. 4. Label each square by three indexes x, y, k, where the pair xy distinguishes from each other the 100 possible values of the position-aspect ⟨E⟩ and $k = 1, 2, ..., \lambda$ singularizes a value of the color-aspect ⟨C⟩, red, green, yellow, etc., defined by reference to a finite sampling of λ colors. Symbolize by $\eta_{xy,k}$ a square labeled in this way. Cut out the 100 squares and mix them in a bag. Consider now the following three procedures.

A. We operate 100 successive extractions of a square, until exhaustion of the content of the bag. The labeling xy, k is individualizing, thanks to the label xy. This label permits to replace each extracted square at its initial place thus reconstituting progressively the Joconda picture by a sequence of partial perceptions of it that can be compared with a random "reading." While the reconstitution evolves, the color-value index k is also registered for each extraction and the numerical values acquired progressively by the λ relative frequencies $n(ck)/N$, $N = 1, 2, ..., 100$, are marked on a sheet of paper. Each relative frequency $n(ck)/N$, k fixed, will necessarily evolve toward the final value $(n(ck)/100)^J$ which, in the integral picture, characterizes the ensemble of the squares where this color-value is dominant. If we repeat the experiment, the evolutions of the relative frequencies $n(ck)/N$, $k = 1, 2, ..., \lambda$, will in general vary from one reiteration to another one, but the final result will be each time the same ensemble of λ relative frequencies $(n(ck)/100)^J$, $k = 1, 2, ..., \lambda$ that, relatively to our color-sampling, characterizes globally the Joconda picture. The λ relative

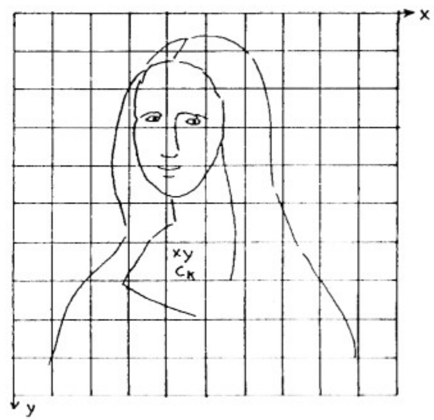

Fig. 4.

frequencies $(n(ck)/100)^J$, $k = 1, 2, ..., \lambda$ act like a "form-field" on the evolving relative frequencies $n(ck)/N$, $N = 1, 2, ..., 100$, like an "attractor" toward the position-and-color-values-form of the picture. But the experiment does not correspond to some probability space, because the initial conditions are not stable, they change after each new extraction, since an extracted square is not thrown back into the bag: there is no—relativized—identically reproduced procedure $P = [\triangle R \to \eta_{\triangle}, \langle g \rangle \eta_{\triangle}]$.

B. Take now 10.000 replicas of the Joconda picture, treat each one as before, and mix up in the bag all the 10.000×100 squares obtained. Then proceed as in the case A. The relative frequencies $n(ck)/N$, $N = 1, 2, ..., 10.000 \times 100$ will have now in the mean 10.000 times slower evolutions toward the final values $(n(ck)/100)^J$, $k = 1, 2, ..., \lambda$. But after 10.000×100 extractions—necessarily—these final values will all realize. The experiment will end up with 10.000 reconstitutions: The same form of position-and-color-values is in the bag, 10.000 times weakened, so acting 10.000 slower, but nonetheless it commands the final result. And again, there is no corresponding probability space.

C. Take now again only one replica of the picture and treat it as in the case A. But now, after each extraction, once the corresponding indexes xy and k have been registered, throw the square back into the bag. So this time the extractions can continue *ad infinitum*. But there is no more reconstitution of the picture. The position indexes xy remain non utilized. The position-and-color-values-form from the bag remains non expressed, it remains pulverized. Only a reflection of it subsists, coded in terms of the λ evolving relative frequencies $n(ck)/N$ of the color-value index k. And there are no more "final" values for these evolving relative frequencies, since $N = 1, 2, ..., \infty$. While for a fixed value of N, no matter how big, the corresponding λ values of $n(ck)/N$ *cease to be predictable with certainty*. On the other hand, we are now in the conditions required by the theory of probabilities, which permit to define a probability chain of the type (14). So let us identify each element of this chain. For it is in its features that it will be possible to discover the significance of the probability measure that it involves.

What is, in the case of the procedure C, the acting delimitator? It consists of

(α) A replica of the Joconda picture is selected, *once* for the whole envisaged experiment.

(β) The replica is squared, the squares are indexed, cut out, put into the bag, and extractions of one square at a time are operated.

So the global delimitator consists of *a product of two hierarchically related operations*, $\triangle = \triangle_{\beta} \triangle_{\alpha} = \triangle_{\alpha\beta}$ with $\triangle_{\alpha}$: selection of the *global*

—invariable—object that has to be examined, in short, "the stable constraints"; $\triangle_{\beta}$: a *parceling* selection of a *part* (one square) of the global object selected by the stable constraint $\triangle_{\alpha}$. Each one complete action of the product-delimitator $\triangle = \triangle_{\beta} \triangle_{\alpha} = \triangle_{\alpha\beta}$ offers for examination one of the 100 squares $\eta_{\triangle_{\alpha\beta}} \leftarrow \triangle R$, but "blindly" from the point of view of knowledge, without there being known as yet which square. The labeling is still unknown. For the moment we are in presence of a square that has been already selected, but not yet examined by some view.

After each realization of a product-delimitation $\triangle = \triangle_{\beta} \triangle_{\alpha} = \triangle_{\alpha\beta}$, the obtained square $\eta_{\triangle_{\alpha\beta}} \leftarrow \triangle R$ is examined *via* the space-color view $\langle EC \rangle = \langle E \rangle \vee \langle C \rangle$, i.e., the description $\langle EC \rangle \eta_{\triangle_{\alpha\beta}} \to \eta_{xy,k} = \eta_h$, $h = 1, 2, ..., 100$ is constructed. (At a first sight one might think that there are $\lambda \times 100$ distinct groups of possible associations $h = xy, k$, since $x = 1, 2, ..., 10$, $y = 1, 2, ..., 10$, $k = 1, 2, ..., \lambda$; but in fact, by the construction of the example, a given joint qualification xy emerges always associated with one same k).

Then a big number of realizations of the succession $[\triangle_{\alpha\beta} R \to \eta_{\triangle_{\alpha\beta}}, \langle EC \rangle \eta_{\triangle_{\alpha\beta}}]$ tends to produce the whole universe of elementary events $\{\eta_{xy,k}\} = \{\eta_h\}$. So the random phenomenon of type (11) is in this case

$$[\{[\triangle_{\alpha\beta} R \to \eta_{\triangle_{\alpha\beta}}, \langle EC \rangle \eta_{\triangle_{\alpha\beta}}]_j, j = 1, 2, ..., N\}, \{\eta_h, h = 1, 2, ..., 100\}] \qquad (11)$$

According as one considers separately the aspects xy and k, or the conjoint aspect $(xy, k = h)$, three distinct probability chains can be constructed, two of type (14) and one of type (14′):

$$[\{[\triangle_{\alpha\beta} R \to \eta_{\triangle_{\alpha\beta}}, \langle E \rangle \eta_{\triangle_{\alpha\beta}}]_j, j = 1, 2, ..., N\}, \{\eta_{xy}, xy = 1, 2, ..., 100\}] \to [\{\eta_{xy}\}, \tau_E, p(\tau_E)] \qquad \text{type (14)}$$

$$[\{[\triangle_{\alpha\beta} R \to \eta_{\triangle_{\alpha\beta}}, \langle C \rangle \eta_{\triangle_{\alpha\beta}}]_j, j = 1, 2, ..., N\}, \{\eta_k, k = 1, 2, ..., \lambda\}] \to [\{\eta_k\}, \tau_c, p(\tau_c)] \qquad \text{type (14)}$$

$$[\{[\triangle_{\alpha\beta} R \to \eta_{\triangle_{\alpha\beta}}, \langle EC \rangle \eta_{\triangle_{\alpha\beta}}]_j, j = 1, 2, ..., N\}, \{\eta_h, h = 1, 2, ..., 100\}] \to [\{\eta_h\}, \tau_{Ec}, p(\tau_{Ec})] \qquad \text{type (14′)}$$

where $p(\tau_E)$, $p(\tau_c)$, $p(\tau_{Ec})$, are the probability measures asserted on the algebras τ_E, τ_c, τ_{Ec}, respectively, such as they are determined by the elementary measures

$$p_E(xy) = \lim_{N \to \infty} [n(E, xy)/N]$$

$$p_c(k) = \lim_{N \to \infty} [n(ck)/N]$$

$$p_{Ec}(xy, k) = \lim_{N \to \infty} [n(Ec, xy, k)/N]$$

Now, *how will we choose these elementary measures*? Evidently we shall assert

$$p_c(k) = \lim_{N \to \infty} [n(ck)/N]^J$$

$$p_E(\eta_{xy}) = \lim_{N \to \infty} [n(E, xy)/N]^J = 1/100 \qquad (13)$$

$$p_{Ec}(\eta_{xy,k}) = \lim_{N \to \infty} [n(Ec, xy, k)/N]^J = 1/100$$

But *why*? We are in the conditions of the experiment C, so the outcome of the relative frequencies $(n(ck)/100)^J$, $k = 1, 2, \ldots, \lambda$ that can be counted on a replica of the Joconda picture for, respectively, the space-aspect E, the color-aspect c and the space-color aspect Ec, is no more insured. Nevertheless we know that the bag contains, parceled, the well known Joconda picture and we are convinced that its form of space-and-color-values, being there, will act, will manifest itself in spite of the parceling. This conviction is what we express by asserting the measures (13) which characterize the Joconda form. Just a bet that the Joconda form of space-and-color-values will surmount its parceling. And notice that this form finds expression—a pulverized expression—only in consequence of the non uniformity of the distribution of the color-values k. The distribution of space-values xy alone, is uniform, it expresses no form at all, no sort of information concerning the Joconda picture: *We are in presence of a manifestation of the second proposition from the frame principle FP*. As to the measure $p_{Ec}(\eta_{xy,k})$, it can inform about the Joconda form, in numerical coding, only because it *contains* the non uniform measure of the color-values, which—accordingly to the frame principle FR—combine with the space-values.

Generalization. The Joconda example is extremely simplifying. In general, when we perceive events obeying to a probability law, we have no direct knowledge of a global form associated with the studied random phenomenon. Furthermore, usually we are in presence of exclusively *transferred* data. Moreover *time* comes in also, in general, in a way which, at the statistical level, is "stabilized" so as to be compatible with the assertions of convergence, of invariance, expressed by the posited probability law. Nevertheless the Joconda example provides essential clues that show the

way toward a general conclusion on the organization and the significances that characterize a relativized probabilistic conceptualization.

Always in a probabilistic description the delimitator has the structure $\triangle = \triangle_\beta \triangle_\alpha = \triangle_{\alpha\beta}$ of a product operator containing two factors working on two hierarchically connected levels.

- By certain operations, I call them "application of stable constraints $\triangle_\alpha$," the partial action $\triangle_\alpha R \to \eta_{\triangle_\alpha}$ produces as object of study a *global* and somehow "invariant" entity $\eta_{\triangle_\alpha}$. For if it did not *there would not be a definite and stable universe of elementary events*, so no probability space either. Then, contrary to the hypothesis admitted here, no convergent values (13) could be defined for the evolving relative frequencies $n(gh)/N$ and the studied pairing $(\triangle, \langle g \rangle)$ would appear *a posteriori* to be non significant.
- By other operations, by "a reproducible random procedure $\triangle_\beta$" of which the action $\triangle_\beta[\triangle_\alpha R] = \triangle_\beta \eta_{\triangle_\alpha}$ is applied upon the global entity $\eta_{\triangle_\alpha}$ delimited by the stable constraints, the delimitator $\triangle_\beta$ always effectuates a random parceling $\triangle_\beta[\triangle_\alpha R] = \triangle_\beta \eta_{\triangle_\alpha} \to \eta_{\triangle_{\alpha\beta}}$ of the global entity $\eta_{\triangle_\alpha}$. For if $\triangle$ did not contain such a random parceling procedure also, the description would appear to be an individual description (of the global "invariant" entity $\eta_{\triangle_\alpha}$), contrary to the hypothesis explored here.

So the product-delimitator from a probabilistic description offers for examination the global entity $\eta_{\triangle_\alpha}$ delimited by it, only progressively, by fragments $\eta_{\triangle_{\alpha\beta}}$ produced in a random order. Then the repetitions of the succession of epistemic operations $[\triangle_\beta \triangle_\alpha R \to \eta_{\triangle_{\alpha\beta}}, \langle g \rangle \eta_{\triangle_{\alpha\beta}} \to \eta_{gk}]$ produces a random phenomenon (11) where the *observable* elementary events η_{gk} are qualifications of the randomly and non observably extracted parcels $\eta_{\triangle_{\alpha\beta}}$ of the global stable entity $\eta_{\triangle_\alpha}$. Qualifications with respect to the aspect-view $\langle g \rangle$, of the "ontic content" of what is labeled $\eta_{\triangle_{\alpha\beta}}$ and has been "blindly" captured by the operation of delimitation $\triangle_\beta \triangle_\alpha R$. So it is "understandable" that these qualifications, like the parcels $\eta_{\triangle_{\alpha\beta}}$ themselves, also vary randomly from one repetition to another one. While the *global* entity $\eta_{\triangle_\alpha}$ escapes perceptibility by examinations with the utilized aspect view $\langle g \rangle$.

But then, if it escapes observation, what a meaning has the assertion that what is labeled $\eta_{\triangle_\alpha}$ "exists"? And what a sense can have the assertion that it is "invariant"?

All what in the physical world is accessible to knowledge, in essence is a form of spacetime-aspect-values (the frame principle FP). If the global entity symbolized by $\eta_{\triangle_\alpha}$ does not exist in the sense of Eq. (3) with respect to the particular aspect-view $\langle g \rangle$, then, insofar as nevertheless it is not mere epistemic void, it *must* exist in the sense of Eq. (7) with respect to some other aspects $g' \neq g$. (In particular the difference between two aspects can reduce to the inequality of the cardinals of their respective sets of value indexes k, i.e., to a difference of only their fields of perception, like in the Joconda case). Then—from the viewpoint of the observer who, confined inside his referential $(\triangle_{\alpha\beta}, \langle g \rangle)$, has obtained a probabilistic description (14)—the descriptions of the global entity $\eta_{\triangle_\alpha}$ introduced by the factor $\triangle_\alpha$ from the delimitator $\triangle_{\alpha\beta}$, with respect to these other aspects $g' \neq g$, can only be conceived of as *potential* forms of spacetime-aspect-g'-values. And these, furthermore, he *must* conceive to be *stable* forms, *individual* descriptions of $\eta_{\triangle_\alpha}$, since the global entity $\eta_{\triangle_\alpha}$ is posited to label precisely what insures the stable universe of elementary events $\{\eta_{gk}\}$ from the studied probabilistic description. So these potential forms can incorporate time only in some mean, "stabilized" sense ("the" time, we feel, when analyzed inside the method of relativized conceptualization, will *split* into a huge infinity of times, each one relative to a definite pair [entity, aspect]. But here we are obliged to leave out the analysis of the concept of time, and to concentrate on our present aim). So what is labeled $\eta_{\triangle_\alpha}$, insofar as it exists, can only exist in the sense that—from the point of view of the observer who constructs the considered probabilistic description—it is the source of *potential stable metaforms, of INDIVIDUAL metadescriptions that would emerge in epistemic referentials where the factor-delimitator* $\triangle_\alpha$ *from* $\triangle = \triangle_\beta \triangle_\alpha$, *alone, would be combined with some aspects* $g' \neq g$ *that are different from the aspect* g *that leads to the studied probabilitistic description.* But such stable metaforms are precisely Popperian "propensities," as it will clearly appear below.

As to the qualification "invariant," it has been too hastily assigned to the entity $\eta_{\triangle_\alpha}$ itself. Insofar as it is not altogether a false absolute, this qualification can only concern the potential g'-metaforms inferred just above, which, though potential, are *descriptions.* This follows from the posited definitions: The delimitator $\triangle_\alpha$ is defined as a purely physical delimitator. So the global entity $\eta_{\triangle_\alpha}$ emerges as yet strictly non qualified. Then, if directly after each reiteration of an operation $\triangle_\alpha R \rightarrow \eta_{\triangle_\alpha}$ we wanted to act on the produced entity $\eta_{\triangle_\alpha}$ with an aspect-view examining "the" invariance, what could that aspect-view *be*, and what could it *see*? "Invariance," "stability," etc.—we saw that—are metaqualifications of prequalified entities, of descriptions, they are essentially relative to some chosen prequalification. In themselves such concepts cannot be conceived, they are but false absolutes. While any invariance relatively to some specified qualification would see nothing on the as yet strictly non qualified entities $\eta_{\triangle_\alpha}$. It simply would yield void, in the sense of Eq. (3).

We can now continue by asking at last the central question: What

significance can be assigned to a probability measure in (13) $p(gh)$, $h = 1, 2,..., L(g)$ corresponding to spacetime-gk qualifications? Or to a probability measure corresponding to space-gk qualifications, like in the chain of type (14′) from the Joconda example? Or to a probability measure $p(gk)$, $k = 1, 2,..., \lambda$, corresponding to an extraction of exclusively gk qualifications, like in the second chain of type (14) from the Joconda example? The answer has a stratified structure.

For simplicity let us consider a measure $p(gk)$ where any spacetime qualification is absent.

—Our preceding conclusion entails that the observable variable elementary events $\eta_{gk} = D(\triangle, \eta_\triangle, \langle g \rangle)$ that emerge by the partial examinations $\langle g \rangle \eta_{\triangle_{\alpha\beta}}$ can be regarded as parceled messages concerning the unknown family of stable potential spacetime-g' metaforms corresponding to the global entity $\eta_{\triangle_\alpha}$. The gk-values of the aspect g communicated by these messages act as coding signs. These, by their convergent relative frequencies $n(gk)/N$, construct progressively, by random touches, a gk-coded ad numerical representation of the family of unknown spacetime-g' metaforms corresponding to the global entity $\eta_{\triangle_\alpha}$. A sort of random reading of them that offers only a pulverized reflection of these possible unknown metaforms of spacetime-g' values. A reflection where is absent any trace of the aspects $g' \neq g$ that could generate these metaforms, as well as, *a fortiori*, of their potential spacetime organization.

— What, now, about the probability measure $p(gk)$ itself, instead of the observable relative frequencies $n(gk)/N$? This measure is *not* of the same *nature* as the relative frequencies $n(gk)/N$. The relative frequencies $n(gk)/N$ belong to the realm of the *directly* observable and measurable, and to the conceptual level of the *evolving* statistical descriptions D^2. While the corresponding probabilities $p(gk) = \lim_{N \to \infty}[n(gk)/N]$ belong to the realm of abstract posits tied with *induction*, and to the conceptual level of the *stable* probabilizations D^3 of the evolving statistical descriptions D^2. Which is a metalevel with respect to the level of the statistical descriptions. These are two distinct though related—hierarchically related—universes. A non removable qualitative breach separates them, a sort of "vertical" conceptual step of which the "height" cannot be quantified. The definitions $p(gk) = \lim_{N \to \infty}[n(gk)/N]$, $k = 1, 2,..., m$ act as planks propped against this indefinite step. They fabricate a *language* that connects the two members of the definition, a mounting way offered to the relative frequencies $n(gk)/N$, toward the level of the family of unknown potential spacetime-g' metaforms corresponding to the global entity $\eta_{\triangle_\alpha}$: The "convergence" *at the limit* $N \to \infty$ leads from the level of the statistics D^2 up onto the superior level of probabilizations D^3; *there*, the probabilities $p(gk)$, $k = 1, 2,..., \lambda$ express in *gk-coded terms* the unknown potential stable spacetime-g' metaforms, $g' \neq g$. They offer a cryptic *translation of these spacetime-g′ metaforms, in the gk-language of the observable relative frequencies n(gk)/N*. Because the ontic content of *these* unknown potential spacetime-g' metaforms is *what* appears progressively, in a parceled way, in the observer's field of perception, while is repeated the succession of epistemic operations $[\triangle_\beta \triangle_\alpha R \rightarrow \eta_{\triangle_{\alpha\beta}}, \langle g \rangle \eta_{\triangle_{\alpha\beta}} \rightarrow \eta_{gk}]$, the probabilities $p(gk)$, $k = 1, 2, ..., \lambda$ seem to act on the observable relative frequencies $n(gk)/N$ as a kind of "attractors." *They express POPPERIAN PROPENSITIES that seem to act on the observable evolving relative frequencies, driving them toward the unknown, potential, stable, spacetime-g′ metaforms*. This, in a sense comparable to how the model from a painter's mind draws toward itself the form that emerges progressively on the canvas while the painter makes his successive touches of color. It is possible to analyze more, as follows.

— The simple assertion of the *existence* of a probability measure $p(gk)$—without specification of its form—amounts to the assertion of existence of a global entity $\eta_{\triangle_\alpha}$ delimited by $\triangle_\alpha$ that is endowed with an ontic content able to reveal, inside convenient epistemic referentials, some stable potential spacetime-g' metaforms, with, in general, $g' \neq g$.

— The specification, furthermore, of *a definite form* for the asserted probability measure, of definite numerical values $p(gk)$, $k = 1, 2, ..., \lambda$, amounts to a coded specification of a *given*, a physically *determined* even though unknown family of potential g'-metaforms.

And indeed the unknown metaforms that set propensities for the evolving observable relative frequencies $n(gk)/N$, $N \rightarrow \infty$, *include the whole "experimental arrangement,"* as Sir Karl Popper so originally and explicitly accentuated [Ref. 8, p. 33]:

> "Take for example an ordinary symmetrical pin board, so constructed that if we let a number of little balls roll down, they will (ideally) form a normal distribution curve. This curve will represent the *probability distribution* for each single experiment, with each single ball, of reaching a possible resting place. Now let us "kick" this board; say, by slightly lifting its left side. Then we also kick the propensity, and the probability distribution, ... Or let us, instead, remove *one pin*. This will alter the probability for every single experiment with every single ball, *whether or not the ball actually comes near the place from which we removed the pin*. ... we may ask: "How can the ball 'know' that a pin has been removed if it never comes near the place?" The answer is: the ball does not "know"; but the board as a whole "knows," and changes the probability distribution, or the *propensity*, for *every* ball; a fact that can be tested by statistical tests."

(To "kick" that board as a whole, we have to change the global delimitator $\triangle_\alpha$ so that it shall produce other stable constraints, another global entity $\eta_{\triangle_\alpha}$).

So the method of relativized conceptualization brings forth *with inner necessity* a "morphic" interpretation of the probabilistic conceptualizations that is a formalized—though not yet a mathematical—development of Sir Karl Popper's famous "propensity" interpretation. Once one has clearly perceived this interpretation, with all the complex connections involved, how ghostly, poor and dispersed appear by contrast the current formulations! Probability spaces of which the generating random phenomenon is often left in the dark; random phenomena that—*when* they are indicated are indicated by mere words or at most by the help of some symbols, but never by specifying the typical *operations* that are involved by them; and above all, even on the most advanced boundaries of modern physics, probability measures that so often are asserted and studied without having explicated the events and the elementary events which they count. Sir Karl Popper has been able to perceive all these lacunae and to eliminate them in essence, without the help of any formalism! (He seems not even to have been aware of Kolmogorov's concept of a probability space). He dealt with the problem barely by the use of this rare power of synthetic penetration that characterizes the greatest minds, a power that needs no technicalities. We are in presence of a case in which a deep new view has been expressed too early for being perceived and understood.

6. THE OPACITY FUNCTIONAL: A MEASURE OF THE PROPENSITY ACTING ON AN EVOLVING STATISTICS AND UNIFICATION OF PROBABILITIES AND INFORMATION

Is it possible to develop *mathematically* the "morphic" interpretation of probabilities brought forth by the typology of relativized descriptions? To construct for it a representation where the merely symbolic expressions be supplanted by formulae inserted in a strictly deductive structure and permitting *numerical estimations*? Yes: In other works,[10, 11] I have built a functional, the "functional of opacity of a statistics with respect to the acting probability law," that is such a mathematical representation of the "morphic" interpretation of probabilities. Very remarkably, *the expression of the opacity functional brings forth, in certain limiting conditions, SHANNON'S INFORMATIONAL ENTROPY*. This entails a deep unification between the probabilistic and the informational approaches. The first features of a *mathematical* epistemic syntax can be perceived. Here, we give only a very amputated account on these results.

Let us start with a "basic" probability chain

$$[\{[\triangle R \to \eta_\triangle, \langle g \rangle \eta_\triangle \to \eta_{gk}]_m, m = 1, 2, ..., M\}, \{\eta_{gk}, k = 1, 2, ..., \lambda\}]$$
$$\to [\{\eta_{gk}\}, \tau_g, p(\tau_g)] \tag{15}$$

where the elementary events η_{gk} are produced by exclusively the one-aspect view $\langle g \rangle$ (the spacetime qualifications being neglected) and τ_g is the total algebra on the universe $U = \{\eta_{gk}, k = 1, 2, ..., \lambda\}$. The measure $p(\tau_g)$ contains then the elementary or "basic" measure $\{p(gk), k = 1, 2, ..., \lambda\} = \{p(\eta_{gk}), k = 1, 2, ..., \lambda\}$.

Let now P^N be the identically repeatable metaprocedure consisting of N successive realizations of the descriptional elaboration $[\triangle R \to \eta_\triangle, \langle g \rangle \eta_\triangle \to \eta_{gk}]$. So the result of *one* realization of P^N is a whole ordered sequence of N descriptions η_{gk}, different or not,

$$\sigma_i^N = (\eta_{gk})_{i1}, (\eta_{gk})_{i2}, ..., (\eta_{gk})_{ij}, ..., (\eta_{gk})_{iN} \tag{16}$$

where: the index i labels the sequence as a whole; the index $j = 1, 2, ..., N$ is the index of order of a description $\eta_{gk} \in \sigma_i^N$. Let us designate by $U^N = \{\sigma_i^N, i = 1, 2, ..., N'\}$ the metauniverse of elementary events consisting of all the N' sequences σ_i^N that can be constructed on the universe of elementary events $\{\eta_{gk}, k = 1, 2, ..., \lambda\}$ from the basic chain in (15). (In general $N' \neq N$, of course).

Consider now an aspect z of "statistical structure of an ordered sequence of length N," each value q of which is defined by a particular *ensemble* of λ relative frequencies $n(gk)/N = f(gk)$, $k = 1, 2, ..., \lambda$ of the λ possible elementary events η_{gk}. In short, a value q of the statistical aspect z will be called "a statistical structure q." The number of the possible different statistical structures q of an ordered sequence of length N is found to be $(N + \lambda - 1)!/((\lambda - 1)!\, N!)$. Consistently with the definition we write:

$$q = \{f_q(gk), k = 1, 2, ..., \lambda\}$$

with:

$$\forall_q, f_q(gk) = [n(gk)/N]_q, \Sigma_k f_q(gk) = \Sigma_k [n(gk)/N]_q = 1,$$
$$k = 1, 2, ..., \lambda, \qquad q = 1, 2, ..., (N + \lambda - 1)!/((\lambda - 1)!\, N!) \tag{17}$$

where, for clarity, *each* one of the λ relative frequencies $n_q(gk)/N = f_q(gk)$ realized inside the considered ensemble q, carries the indexation q that characterizes also that ensemble as a whole.

Consider now the following metachain of probability:

$$[\{[\triangle^N R \to \sigma_i^N, \langle ng \rangle^{(2)} \sigma_i^N \to \sigma_i^N(q)]_s, s = 1, 2, ..., S,$$
$$q = 1, 2, ..., (N + \lambda - 1)!/((\lambda - 1)!\, N!)\}]$$
$$\to [U^N(q), \tau_q^N, p^N(\tau_q)] \tag{18}$$

where: the metadelimitator $\triangle^N$ introduces, by the operations $\triangle^N R$, the ordered sequences σ_i^N; the view of g-population $\langle ng \rangle^{(2)}$ (included in the metaview of probability relative to the aspect g), successively applied to the various ordered sequences σ_i^N introduced by $\triangle^N$, qualifies them furthermore by the corresponding value q of statistical structure thereby producing the metauniverse $U^N(q) = \{\sigma_i^N(q), \quad q = 1, 2, ..., (N + \lambda - 1)!/((\lambda - 1)!\, N!)\}$ of the descriptions $\sigma_i^N(q)$ of the statistical structures of the ordered sequences $\sigma_i^N \in U^N$, that is, the universe of elementary events from the space from Eq. (18); $s = 1, 2, ..., S$ is the index of order of a succession of two operations $[\triangle^N R \to \sigma_i^N, \langle ng \rangle^{(2)} \sigma_i^N \to \sigma_i^N(q)]$; τ_q^N is the total algebra on $U^N(q)$; $p^N(\tau_q)$ is the probability measure on τ_q^N. Now, *what is the probability $\pi(q, N)$ for the realization of an ordered sequence $\sigma_i^N(q)$ where the statistical structure possesses a specified value q?*

If the events $(\eta_{gk})_{ij}$ from (16) are supposed to be independent (zero memory source emitting the σ_i^N), the answer is immediate. The measure $p^N(\tau_q)$ yields, for *one* and *ordered* sequence $\sigma_i^N(q)$, the probability

$$p^N[\sigma_i^N] = p[(\eta_{gk})_{i1}]\, p[(\eta_{gk})_{i2}] \cdots p[(\eta_{gk})_{ij}] \cdots p[(\eta_{gk})_{iN}]$$
$$= \Pi_k\, [p(gk)]^{n(gk)} \tag{19}$$

with $\Sigma_k n(gk) = N$, $k = 1, 2, ..., \lambda$. Then accordingly to the law of total probabilites, the probability of *any* ordered sequence $\sigma_i^N(q)$ possessing the given statistical structure q, is just the sum of the probabilities of all the ordered sequences σ_i^N where is realized that value q of statistical structure, i.e., the following function of q and N:

$$\pi(q, N) = [N!/\Pi_k[n_q(gk)]!][\Pi_k\, [p(gk)]^{n_q(gk)}] \tag{20}$$

where the first factor is the permutability of a sequence $\sigma_i^N(q)$.

Imagine now that N increases. At this stage comes in an important remark: λ being fixed, one *same* statistical structure q can realize in a whole certain *infinity* of ordered sequences of *different lengths* $N_{q1} < N_{q2} < \cdots < N_{qr} < \cdots$, each one of these lengths N_{qr}, $\forall r$, being such that $\Sigma_k n_q(gk, r) = N_{qr}$, $k = 1, 2, ..., \lambda$, where $n_q(gk, r)$ is the number of realizations of η_{gk} in an ordered sequence $\sigma_i^N(q)$ that has a length N_{qr}. (Which insures for any N_{qr} the condition of norm $\Sigma_k f_q(gk) = \Sigma_k n_q(gk)/N_{qr} = 1$ from Eq. (17)). So it is possible to let N tend toward ∞ only *via* values all belonging to the family of the numbers N_{qr}. In other words, *it is possible to impose the condition that the statistical structure q be kept FIXED while N tends toward* ∞. (The notation $q = \{f_q(gk),\ k = 1, 2,..., \lambda\}$, independent of N, has been chosen in order to stress this possibility). Let us indicate by the symbol $[\lim_{N \to \infty}/q$ fixed$]$ a passage to infinity subject to this constraint of invariance of the statistical structure q.

We ask now the question: *How evolves the probability* $\pi(q, N)$ *of a sequence* $\sigma_i^N(q)$ *when N tends toward* ∞ *the statistical structure q being maintained fixed*? This is a nodal question. Indeed the answer to this question will obviously have extracted the essence of the relation between the statistical structure q and the basic probability law $p(gk)$, independently of the length N of a sequence. In order to obtain, as an answer, an additive and "normed" expression, we choose to work with the quantity $\log[\pi(q, N)/N]$. So finally what we research is $[\lim_{N \to \infty}/q$ fixed$]$ of $[\log \pi(q, N)]/N$. One finds

$$\begin{aligned}[\lim_{N \to \infty}/q \text{ fixed}]\ &[\log \pi(q, N)]/N \\ &= \Omega[q/p(gk)] = \Sigma_k f_q(gk) \log f_q(gk) - \Sigma_k f_q(gk) \log p(gk) \\ &= \Sigma_k f_q(gk) \log[f_q(gk)/p(gk)] \end{aligned} \tag{21}$$

The functional of the basic probability law $p(gk)$ and a fixed statistics q that is symbolized $\Omega[q/p(gk)]$ is positive (Refs. [10] and [11]) and its absolute minimum is 0. I have called it "the functional of opacity of a statistics q with respect to the acting probability law $p(gk)$," in short, "the opacity functional." This denomination reflects that the opacity functional associates a numerical global measure to the degree of *non-transparency* of a given statistics q, with respect to the basic probability law $p(gk)$ involved in the Eq. (15). It measures the "distance" between

— the acting basic probability law $p(gk)$ that represents a family of potential unknown spacetime-g' metaforms, with, in general, $g' \neq g$, and

— one (no matter which one, but fixed) among all the different statistical structures q that can realize in a sequence σ_i^N of N events η_{gk}, with N *arbitrarily big*; *i.e.*, one among all the possible progressive "random readings"—in the gk-coded language of the relative frequencies $n(gk)/N$—of the family of potential unknown spacetime-g' metaforms represented by the basic probability law $p(gk)$ (a reading that can be arbitrarily "erroneous" in the conditions supposed by the theory of probabilities).

So, with another *equivalent* language, *the opacity functional measures globally the "propensity" of any statistics q, toward the probability law* $p(gk)$, $k = 1, 2,..., \lambda$. Indeed: The opacity functional "compares" the *statistical entropy* $\Sigma_k f_q(gk)_q \log f_q(gk)_q$ of the studied statistics q, with the quantity $\Sigma_k f_q(gk) \log p(gk)$ (which I called "the modulation of the basic probability law $p(gk)$ by the statistics q"). If the considered statistical structure q is very different of the structure of the basic probability law $p(gk)$, i.e., if the differences $f_q(gk) - p(gk)$ are relatively non negligible for a relatively big number of indexes k, the two compared terms have notably different structures and the functional has a big value. This value decreases when one considers statistical structures q that go increasingly "near" to the structure of the acting probability law $p(gk)$. In the limiting case of a statistical structure "qF" that is strictly "faithful" to the basic law $p(gk)$, i.e., if we have

$$f_{qF}(gk) = p(gk), \qquad k = 1, 2,..., \lambda \tag{22}$$

the two terms from $\Omega[q/p(gk)]$ identify as to their formal structure and their absolute numerical value (though *not* also as to their semantic content) *acquiring both the well known structure of Shannon's "informational entropy"*!:

$$\begin{aligned}|\Sigma_k f_q(gk) \log f_q(gk)| &= |\Sigma_k f_q(gk) \log p(gk)| \\ &= |\Sigma_k p(gk) \log p(gk)| = |H(p(gk))| \end{aligned} \tag{23}$$

Then the opacity functional becomes zero reaching its absolute minimum.

> *The "informational entropy"* $H(p(gk))$ *of the acting probability law, that has been DIRECTLY POSTULATED by Shannon, emerges here DEDUCTIVELY. And it emerges endowed with the significance of the—stable—"selector," among all the different statistics q that can be realized on the universe of elementary events* $\{\eta_{gk},\ k = 1, 2,..., \lambda\}$, *of the statistics that reproduces the acting probability law* $p(gk)$.

Shannon's informational entropy $H(p(gk)) = \Sigma_k p(gk) \log p(gk)$ appears here as an "attractor" in René Thom's sense[12], placed on the metalevel of the family of unknown potential spacetime-g' metaforms represented by the basic law $p(gk)$, $k = 1, 2,..., \lambda$, (with $g \neq g'$) and acting therefrom upon the evolving statistical entropies $\Sigma_k f_q(gk) \log f_q(gk)$. But the topological characters are pulverized by the probabilistic conceptualization. So the opacity functional $\Omega[q/p(gk)]$ can be regarded as a measure of only the *global* “instantaneous force” of this attraction. So as a measure of the Popperian “propensity” of each instantaneous statistics $q=\{f_q(gk), k=1, 2,..., \lambda\}$, toward the family of stable potential spacetime-g' metaforms, $g' \neq g$, represented in gk-coded language by the stable basic probability law $p(gk)$, $k=1, 2,..., \lambda$.

I have proved (Refs. [10 and 11]) that:

— *For any pair of two arbitrarily small positive real numbers* η, δ, *there exists an integer* N_0 *such that* $\forall N \geqslant N_0$, $\pi(\Omega[q \mid p(gk)] \leqslant \eta) \geqslant 1-\delta$, *where* $\pi(\Omega[q \mid p(gk)] \leqslant \eta)$ *is the probability of the event* $(\Omega[q \mid p(gk)] \leqslant \eta)$ *that the value of the opacity functional be smaller than* η. At a first sight it might seem that this result is no more that the weak law of big numbers. But in fact, while the weak law of big numbers takes only *separately* into consideration *each* difference $|f_q(gk)-p(gk)|$, the opacity functional treats *globally* of a statistical structure $q=\{f_q(gk), k=1, 2,..., \lambda\}$ and of the probability law $p(gk)$, $k=1, 2,..., \lambda$. These, furthermore, are explicitly inserted in a very complex *tissue* of mutually connected *relative* descriptions of different levels containing (besides the basic probability law $p(gk)$, $k=1, 2,..., \lambda$): the whole infinity of possible statistics $q(\lambda, N)$, $N \to \infty$ realizable on the universe of elementary descriptions $\{\eta_{gk}\}$; the two metaprobabilities $p^N[\sigma_i^N]$ and $\pi(q, N)$; the evolving statistical *entropies* $\Sigma_k f_q(gk) \log f_q(gk)$; the stable “informational” (meta)*entropy* $H(p(gk))=\Sigma_k p(gk) \log p(gk)$ of the basic probability law $p(gk)$. So the opacity functional *incorporates* the weak law of big numbers as only a parceled, a pulverized reflection of a much more integrated and complex functioning. This functioning appears displayed in the proofs of the properties of the opacity functional [Refs. 10 and 11]. Which constitutes:

— a preorganized conceptual ground for a systematic examination of the significance and the limits of the second principle of thermodynamics [Refs. 10 and 3]. (I have reobtained *deductively* the principle of Jaynes, as a consequence of the principle of separation PS);

— a framework where the concepts of the theory of information (mutual information, information gain, semantic content of a source of information, etc.) acquire *explicit probabilistic definitions* and clear, relativized “significances.”[(3)]

The “morphic” interpretation of probabilities, which develops the Popperian “propensity” interpretation, has acquired a mathematical

expression. Thereby (unexpectedly!) the insertion of the informational approach, into the theory of probabilities, has become explicit: *Inside the relativizing epistemic syntax* $[\triangle, \eta_\triangle, \langle\,\rangle, D]$ *there appears A UNIFIED AND RELATIVIZED PROBABILISTIC—INFORMATIONAL THEORY.* The first features of a *mathematical* relativizing epistemic syntax $[\triangle, \eta_\triangle, \langle\,\rangle, D]$ are worked out. Their association with convenient generalizations of the quantum mechanical representation of the transferred descriptions of microsystems, might lead to remarkable results.

6. ON OBJECTIVITY, TRUTH, SIMPLICITY

6.1. Are Probabilities Objective or Subjective?

Relativity of Probabilistic Elementarity. When one passes from one level of probabilization, to another one, we said, specificities of the new level appear. A most important example was the transgression of the domain of the nowadays theory of probabilities by the passage from the probabilization of, separately, a branch of a statistical description, to the probabilization of the whole statistical description. Here is another example.

The elementary events η_{gh} from a chain (14), corresponding to only one-aspect-view $\langle g \rangle \in \langle b \rangle$, are contained in the metachain (14′) also, but only implicitly and as *non* elementary events, belonging to the *algebra* τ_b of *events*. Indeed:

Inside the probability space of Eq. (14), each $\eta_{gh}=D(\triangle, \eta_\triangle, \langle g \rangle)_h$, $h=1, 2,..., L(g)$, is a description that is *maximally* detailed *with respect to the aspect-view* $\langle g \rangle \vee \langle Ed \rangle$ *working there*; the framework offered by the epistemic referential $(\triangle, \langle g \rangle \vee \langle Ed \rangle)$ does not permit a further analysis of these descriptions. Inside this framework each description $\eta_{gh}=D(\triangle, \eta_\triangle, \langle g \rangle)_h$ is introduced as a ultimate *monolith* of qualifications, simply *posited* to be “distinct” from all the other elementary descriptions $\eta_{gh'}=D(\triangle, \eta_\triangle, \langle g \rangle)_{h'}$, $h' \neq h$. This is so because inside the chain (14) each description $\eta_{gh}=D(\triangle, \eta_\triangle, \langle g \rangle)_h$ is introduced quite independently of any explicit or implicit reference to other qualifications of the entity $\eta_\triangle$ which can emerge by examinations *via* other aspects, different of the view $\langle g \rangle \vee \langle Ed \rangle$.

On the contrary inside the chain (14′), the view $\langle b \rangle$ which acts there contains also other aspect-views besides the aspect-view $\langle g \rangle$. So inside the epistemic referential $(\triangle, \langle b \rangle)$ the descriptional effect of the aspect-view $\langle g \rangle$ is *comparable* to the descriptional effects of these other aspect-views. The designatum of the symbol $\eta_{gh}=D(\triangle, \eta_\triangle, \langle g \rangle)_h$ is now only a possible *feature*, a possible sub-description contained in some of the descriptions $\eta_{bh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)_h$, $h=1, 2,..., L(b)$, $L(b)\geqslant L(g)$ which are the *elementary* events *from the chain in Eq.* (14′). This designatum, furthermore, is devoid of designation, the symbol $\eta_{gh}=D(\triangle, \eta_{\triangle}, \langle g\rangle)_h$ does not participate explicitly to the symbolization of the chain (14′). *If* nevertheless it is conceived of, in Eq. (14′) the symbol $\eta_{gh}= D(\triangle, \eta_{\triangle}, \langle b\rangle)_h$ can designate the fact that some among the various descriptions $\eta_{bh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)_h$, $h=1, 2,..., L(b)$ that are maximally detailed with respect to the view $\langle b\rangle$ would collapse into the description $\eta_{gh}=D(\triangle, \eta_{\triangle}, \langle g\rangle)_h$ if exclusively the spacetime-gk qualifications were taken into account. This means that inside the chain (14′) the description $\eta_{gh}=D(\triangle, \eta_{\triangle}, \langle g\rangle)_h$ is an *event* belonging now to the algebra τ_b, not an *elementary* event: it is the *union* of all the elementary events η_{bh} from the universe $\{\eta_{bh}, h=1, 2,..., L(b)\}$ which are such that their "projection" onto the semantic subspace introduced by the view $\langle g\rangle \vee \langle Ed\rangle \in \langle b\rangle$ is precisely the description η_{gh}.

So the descriptions $\eta_{gh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)_h$ which inside the probability space from the chain (14) are posed to be elementary, appear as non-elementary in Eq. (14′) because *there* they are *less specified, less detailed* than the descriptions η_{bh} that can be obtained by the help of the *more complex* acting view $\langle b\rangle$: with respect to this more complex view any description η_{gh} appears as *simpler*, i.e., as more "abstract" than any description η_{bh}: *The character of elementarity or non-elementarity of an event, in the sense of probabilities, is relative to the view acting in the basic epistemic referential which generates the considered probability chain.* When one passes from an initial probability chain, to another one where the acting view is *less* simple, the descriptions from the initial space appear as *more* simple. A sort of conservation of the amount of simplicity works with respect to this transformation.

The Principle of Laplace as a Consequence of the Principle of Separation. Consider a probabilization $D^{(3)}$ of a previous statistical description $D^{(2)}$. Each probability law involved by this probabilization belongs to a branch-chain (14′) (that in particular can reduce to a one-aspect chain (14)). So let us examine the measure $p(\tau_b)$ from Eq. (14′). Each realization of the procedure $[\triangle R\rightarrow\eta_{\triangle}, \langle b\rangle\eta_{\triangle}\rightarrow\eta_{bh}]$ produces one elementary event $\eta_{bh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)$ from the universe of elementary events $U=\{\eta_{bh}, h=1, 2,..., L(b)\}$. The total algebra τ_b contains the elementary events η_{bh}. So the measure $p(\tau_b)$ contains some measure $p(\eta_{bh})=p(bh)$. Now:

Theorem P(S-L). In consequence of the principle of separation PS, inside a description $D^{(3)}$ an *elementary* measure $p(bh)$ from a branch-chain

(14′), $\forall\langle b\rangle\subset\langle T\rangle$, can be only uniform if it is assigned *A PRIORI*, i.e., in absence of previous measurements on the corresponding relative frequencies $n(bh)/N$.

Proof. Each elementary event $\eta_{bh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)$ is *unique* in U and carries a qualification which is *maximal* with respect to the view $\langle b\rangle$ acting in Eq. (14): all the aspect-views $\langle g\rangle\in\langle b\rangle$ available in $\langle b\rangle$, as well as the frame-view $\langle Ed\rangle\in\langle b\rangle$, are posited to have worked on the entity $\eta_{\triangle}\leftarrow\triangle R$ and all the found configurations of values gk, $\mathbf{r}t$ are posited to have been included in the description $\eta_{bh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)$. No other one-aspect-views besides those from the branch-view $\langle b\rangle$ and available inside $D^{(3)}$ can produce on $\eta_{\triangle}\leftarrow\triangle R$ an additional qualification connected with the measure $p(bh)$: By construction $D^{(3)}$ contains only the one-aspect-views $\langle g\rangle\in\langle T\rangle$, one definite frame-view $\langle Ed\rangle\in\langle T\rangle$, and the probabilistic meta-metaviews corresponding to the one-aspect views $\langle g\rangle\in\langle T\rangle$, with structure

$$\langle Pg\rangle^{(3)}=\langle Sg\rangle^{(2)}\vee\langle Cg\rangle^{(3)}=\langle g\rangle\vee\langle ng\rangle^{(2)}\vee\langle Cg\rangle^{(3)}$$

But the branch-views different from that one considered contain only aspects $\langle g\rangle\in\langle T\rangle$ that are *not related* with the measure $p(bh)$ posed on the universe $U=\{\eta_{bh}=D(\triangle, \eta_{\triangle}, \langle b\rangle)\}$ (incompatible processes of examination). Furthermore, so long that no measurements of relative frequencies $n(gh)/N$ have been performed, the metaviews $\langle ng\rangle^{(2)}$ and $\langle Cg\rangle^{(3)}$ *have not yet worked, they have not produced qualifications.* In these conditions a *non-uniform* *A PRIORI* assignation for $p(bh)$ could stem only from the surreptitious *presupposition* (envisaging) of

— either the *suppression* of the action on $\eta_{\triangle}\leftarrow\triangle R$, of at least one aspect-view $\langle g\rangle\in\langle b\rangle$ or of values of at least one of the frame-views $\langle E\rangle\in\langle T\rangle$, $\langle d\rangle\in\langle T\rangle$ (larger units);

— or the *addition* in $\langle b\rangle$ of the action of at least one new aspect-view $\langle g\rangle\notin\langle b\rangle$ or of new values for at least one of the frame-views $\langle E\rangle\in\langle T\rangle$, $\langle d\rangle\in\langle T\rangle$ (smaller units).

Both would constitute a surreptitious *modification* of the initially posited basic epistemic referential $(\triangle, \langle T\rangle)$, so of the description $D^{(3)}$ (a fluctuation toward another description). *Which would violate PS.* Inside $D^{(3)}$ there is *NO REFERENCE* permitting to introduce *a priori* a non uniform elementary measure. ∎

This proof holds in particular for the case $\langle b\rangle\equiv\langle g\rangle$ i.e., for any one-aspect chain (14).

The principle of Laplace *also*, if applied to the probability spaces from the Eqs. (14) or (14′), would require the *a priori* equipartition of the corresponding measure $p(gh)$ or $p(bh)$. In *this* sense inside our approach the principle of Laplace is entailed by the principle of separation PS, for any probability-chain of type (14) or (14′) from any probabilistic description $D^{(3)}$. So for a probabilistic description $D^{(3)}$ we can speak of a principle "P(S-L)" (principle Separation-Laplace).

Syntactic Character of the P(S-L) Equipartions. We now assert that the *a priori* equipartitions of the elementary measures $p(gh)$ and $p(bh)$ required by the principle P(S-L) possess an exclusively syntactic character:

Theorem TS. The *a priori* equipartitions required by P(S-L) for the elementary measures from the probabilistic descriptions cannot be all true, they are purely syntactic requirements.

Proof. Imagine a description $D^{(3)}$ consisting of a probability chain (14) where the epistemic referential is $(\triangle, \langle g\rangle \vee \langle Ed\rangle)$ (in short, $(\triangle, \langle g\rangle)$). Inside this description the principle P(S-L) commands the *a priori* equipartition of the measure $p(gh)$:

$$\forall h,\ p(gh) = 1/L(g) = \text{const.}, \qquad h = 1, 2, \ldots, L(g) \tag{24}$$

with $L(g)$: the cardinal of the universe $U = \{\eta_{gh},\ h = 1, 2, \ldots, L(g)\}$ of basic elementary events $\eta_{gh} = D(\triangle, \eta_\triangle, \langle g\rangle)_h$ from $D^{(3)}$. While inside a probabilization $(D^{(3)})' \neq D^{(3)}$ founded on a basic referential $(\triangle, \langle b\rangle)$ with $\langle b\rangle \supset \langle g\rangle$ and with the *same* $\triangle$ and $\langle Ed\rangle$, the principle P(S-L) commands the *a priori* equipartition of the corresponding measure $p(bh)$:

$$\forall h,\ p(bh) = 1/L(b) = \text{const.}, \qquad h = 1, 2, \ldots, L(b) \geqslant L(g) \tag{25}$$

with $L(b)$: the cardinal of the universe $U = \{\eta_{bh},\ h = 1, 2, \ldots, L(b)\}$ of basic elementary events $\eta_{bh} = D(\triangle, \eta_\triangle, \langle b\rangle)_h$ from $(D^{(3)})'$. Then inside $(D^{(3)})'$ the measure $p(gh)$ will *not* be uniform in general. Indeed inside $(D^{(3)})'$ we have now

$$\forall g, \forall k,\ p(gh) = (1/L(b)) \sum_h N(k, h), \qquad h = 1, 2, \ldots, L(b) \tag{26}$$

where: the sum $\sum_h$ runs over all the descriptions $D(\triangle, \eta_\triangle, \langle b\rangle) = \eta_{bh}$ from $U = \{\eta_{bh},\ h = 1, 2, \ldots, L(b)\}$; $N(k, h)$ designates the number of occurrences of the sub-configuration $\eta_{gh} = D(\triangle, \eta_\triangle, \langle g\rangle)$ of exclusively space-time-gk values inside the elementary description $D(\triangle, \eta_\triangle, \langle b\rangle) = \eta_{bh}$ produced by the view $\langle b\rangle$ with $\langle b\rangle \supset \langle g\rangle$. In the particular case $\langle b\rangle \equiv \langle g\rangle$ we have $L(b) = L(g)$ and $N(k, h) = 1$, $\forall k, \forall h$, so (26) yields the P(S-L) equipartition (25) corresponding to $(\triangle, \langle g\rangle)$. But *in general* a number $N(k, h)$ from (26) can be zero, or one, or some other integer, so in general the calculated measure $p(gh)$ will *not* be found uniform. However, since the delimitator $\triangle$ is the same in $D^{(3)}$ and $(D^{(3)})'$, the *entities* examined in $(\triangle, \langle g\rangle)$ and in $(\triangle, \langle T\rangle)$ are the *same*, $\eta_\triangle \leftarrow \triangle R$. While the measure $p(gh)$ estimated for them concerns in *both* cases only the qualifications *via* the *one and same* view $\langle g\rangle \vee \langle Ed\rangle$: We are in presence of an effect of the relativity of the elementarity. Now: either the *a priori* equipartition (24) of the probability measure $p(gh)$ required by PS-L inside $D^{(3)}$ is false, or the non uniformity (26) of this same measure $p(gh)$ inside $(D^{(3)})'$—entailed there by the same pinciple P(S-L) but applied to $p(bh)$—, is false. □

> *The equipartitions required by P(S-L) are not semantic informations, they are not "propositions" that involve their own truth (Tarski). They are exclusively methodological commands. They command the syntaxis, the structuration of the conceptualization, its "writing," so that it shall maximally exploit its available powers and never transgress them.*

The equipartitions required by P(S-L) insure, for *each* attempted probabilistic description, $D^{(3)}$, $(D^{(3)})'$ etc., that, for the objects selected for study by the delimitator $\triangle$ that acts inside the corresponding basic epistemic referential $(\triangle, \langle T\rangle)$, the description yields the maximal qualification that is possible *via* the view $\langle T\rangle$ acting inside that referential. But it also announces that the considered probabilistic description does not contain criteria permitting to distinguish between the measures to be assigned to events (descriptions) that are elementary with respect to another, more complex view $\langle T\rangle' \supset \langle T\rangle$. Concerning the *truth* of the methodological equipartition required by it, the principle P(S-L) asserts *nothing*.

The truth of the *a priori* equipartitions commanded by the principle P(S-L) for a probability law $p(gh)$ or $p(bh)$, can be controlled only *a posteriori*. Namely by *measurements of the corresponding relative frequencies $n(gh)/N$ or $n(bh)/N$*. An *a priori* equipartition of a probability law opens up an *a priori-a posteriori* dialog, a syntaxis-semantics dialog, a "zitter-conceptualization" in which the *a priori* equipartitions are only a purely syntactical overture. Just a working hypothesis. For example: *if* the elementary measure $p(\eta_{bh})$ from $(D^{(3)})'$ *were* uniform, *then* the form of the corresponding measure $p(gh)$ *would* be that from Eq. (26). This is the first part of a syllogistic structure. The second part, the corresponding semantical part completing the syllogism, would be: but the elementary measure $p(\eta_{bh})$ from $(D^{(3)})'$ *is* uniform indeed, so the form of the corresponding measure $p(gh)$ is indeed that from Eq. (26). But this second part is absent. In order to obtain it, measurements of relative frequencies are necessary.

"Significance" of the Truth of a P(S-L) Equipartition. What "significance" possesses the *a posteriori* falsity (or truth) of the *a priori* equipartition of an elementary probability measure? Consider the probabilistic description $D^{(3)}$ founded of the basic epistemic referential $(\triangle, \langle g \rangle \vee \langle Ed \rangle)$ (in short, $(\triangle, \langle g \rangle)$). Accordingly to the principle P(S-L) the elementary probability measure $p(gh)$ has been *a priori* posited to be uniform. What would we say if *a posteriori* measurements of the corresponding relative frequencies $n(gh)/N$ would indicate a curved up, non uniform probability distribution? Irrepressibly, we would consider this as a factual *proof* (a "(∂, N, N')-proof" in the sense of the discussion that follows the definition of a probabilization with respect to a one-aspect view) that the view $\langle g \rangle \vee \langle Ed \rangle$ from the basic referential $(\triangle, \langle g \rangle)$ on which is founded the description $D^{(3)}$ is *not rich enough* for yielding, by a formula of the type (26), the true distribution. We would conclude that the complexity, the "thickness" of the initial layer of elementary descriptions, has to be increased so that it shall offer a "quantity of prime qualification-matter" sufficient for carving out of it a curved distribution $p(gh)$ by a formula of type (26). We would say that the "good" epistemic referential in order to get such a "thicker" initial layer of qualifications has to contain the same delimitator $\triangle$ that acts in $(\triangle, \langle g \rangle)$ but some richer basic view $\langle b \rangle \supset \langle g \rangle$ containing "all" the qualifications—aspects or values of aspects—that "*really influence*" the observable relative frequencies $n(gh)/N$. Some of which certainly are absent in $\langle g \rangle \vee \langle Ed \rangle$. And conversely, if the measured relative frequencies $n(gh)/N$ would indicate a uniform probability distribution we would say that the utilized basic view $\langle g \rangle \vee \langle Ed \rangle$ contains all the qualifications—aspects or values of aspects—that "*really influence*" the observable relative frequencies $n(gh)/N$. In this sense the "significance" of the truth-qualification of a probability distribution can be translated in terms of "sufficient richness" of the view that acts inside the corresponding basic epistemic referential.

Conclusion on the Objectivity of Probabilities. The probabilistic conceptualization is not in the least subjective. It only makes use of an unavoidable strategy of *a priori-a posteriori* cognitive "zitter-dynamics" concerning *measurable* values of *observable* relative frequencies, non removably subjected to *objective* descriptional relativities.

6.2. Consciousness, Objectivity, Simplicity

I would like to add some final remarks reduced to a quite daring brevity.

In the first place, the method exposed here in a declared way—assigns to consciousness a central role in the cognitive elaborations. In *this* sense "subjectivity" cannot be elided from the method.

In the second place, this does not in the least hinder the possibility of descriptions that are "objectively true" in the sense of *reproducibility of certain invariants with respect to a given view.*

In the third place, the "subjectivity" entailed by the central role assigned to consciousness by no means stays in the way of the quest of objectivity in the sense of *consensus* concerning relative descriptions obtained by *different observers*. Quite on the contrary, this quest acquires inside the method a particularly clear status: The status of a metaproblem concerning the metadescription of an ensemble of descriptions realized by the help of an ensemble of distinct epistemic referentials $(\triangle, \langle\,\rangle)$ *such* that

- each epistemic referential from the ensemble is perceived by the observer to whom it belongs in the *same* way that any other referential from the ensemble is perceived by the observer to whom *it* belongs;
- a *meta* observer might perceive the various epistemic referentials from the ensemble as possessing *different* "states of observation."

Einstein's approach concerning this type of metaproblem is striking. It consists of the *requirement* that the *aspects* utilized for building the views be such that the corresponding descriptions, while they are objective in the sense of reproducibility, be also objective in the sense of consensus, inside a definite class of epistemic referentials. Which amounts to *a method for constructing "good" views*: the views are fabricated such as to insure consensus, in specified conditions. Einstein's approach can be coherently integrated in the method of relativized conceptualization, that drew from it inspiration, *and* generalizes it.

Now, the intrinsic metaconceptualizations, when they are well achieved, bring to mutual coherence, to consensus, ensembles of different transferred descriptions (branch-descriptions). Thereby a strong relation appears between consensus, intrinsic metaconceptualization, and simplicity of the descriptional forms.

7. PERSPECTIVE

I hope to show in other works how the relativizing epistemic syntax $|\triangle, \eta_{..}, \langle\,\rangle, D|$ leads to:

- a deeper and relativized reformulation of logic;
- unification between relativized logic and the relativized reconstruction of probabilities;

— explication of the *hidden* descriptional relativities from the nowadays Dirac-Hilbert formulation of quantum mechanics *and* from Einstein's theory of relativity;
— improved reformulations of these two theories, that might lead to a unification;
— the sketch of a *mathematical* relativizing epistemic syntax $[\triangle, \eta_{\triangle}, \Diamond, D]$.

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