THE METHOD OF RELATIVIZED CONCEPTUALIZATION

The *method of relativized conceptualization – MCR* – keeps developing since 1984 (MMS [1984], [1991], [1992B], [1992C], [1993], [1995], [1997A], [2002A], [2002B], [2006], [2009], [2011]. This method has been constructed by a synthesis and an adequate generalization of results progressively obtained concerning the way in which the mathematical formalism of fundamental quantum mechanics succeeds to signify. We devote this account to a telegraphic sketch of the genesis and of the main features of the method of relativized conceptualization.

I. Genesis of *MRC*: Infra-Quantum Mechanics (IQM)

I.1. A hypothesis tied with a historical fact

There has been no equivalent, for quantum mechanics, of a Newton, a Maxwell, a Carnot, a Boltzmann, an Einstein. Quantum mechanics arose without a unique initial author. It arose from a relatively big number of very different contributions (by Plank, Einstein, Bohr, de Broglie, Schrödinger, Heisenberg, Born, Pauli, von Neumann, Dirac, etc.) that finally led to a coherent mathematical theory of microstates – *fundamental* quantum mechanics[1] – that yields predictions founded on a system of algorithms. However, up to this very day, the quantum mechanical algorithms possess a cryptic character and raise problems of interpretation. *Nobody claims to fully understand* ***how quantum mechanics manages to signify***.

What determined this very peculiar specificity?

This question, when one becomes aware of it, suggests the following hypothesis. The aim, for a human being, to construct knowledge concerning microstates, has involved a cognitive situation so radically different from all those encountered before, and so *extreme*, that no individual mind has been able, in isolation, to dwell with it globally and to construct a coherent representation. But each time that this or that physicist tried to confront the aim of constructing some knowledge about microstates, this *same* very peculiar cognitive situation *acted* inside that physicist's mind, without getting wholly explicit.

So the construction of the quantum mechanical formalism has been orchestrated by an impersonal, very peculiar cognitive situation.

As for the way of signifying of the quantum mechanical formalism, it remained cryptic because, over and over again, each time that an interpretation problem was formulated and examined, that problem was much more referred to the formalism itself, than to the cognitive situation that determined the structure of the formalism. Correlatively, this cognitive situation and its consequences so far have *never* as yet been characterized explicitly, thoroughly and globally.

I.2. A project

The hypothesis formulated above has suggested a project: to make *tabula rasa* of the mathematical formalism of quantum mechanics and to try to construct – in strictly *qualitative* terms – some communicable and consensual knowledge concerning 'microstates', by obeying exclusively the constraints imposed by the involved cognitive situation and by the general human ways of conceptualizing. This project led to what I have called *infra-quantum mechanics (IQM)*: a sort of epistemological-physical representation of microstates, constructed *independently* of the quantum theory but where the whole way of signifying of fundamental quantum mechanics finally becomes clear (MMS [2011]).

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[1] We make a radical distinction between fundamental quantum mechanics where no models are explicitly formed – nor permitted in principle – and on the other hand preceding or subsequent theories of microscopic physical entities (atomic and nuclear physics and elementary particles theories) that quite explicitly introduce models.

I.3. Sketch of the construction of infra-quantum mechanics

What follows is summarized to the extreme. The exposition is focused upon the goal to bring into evidence the ***radically basic and relative*** *character of the form of description that is involved in the formalism of quantum mechanics*, a form that up to now has remained quite unknown. It is hoped that via the sketch of the genesis of the descriptions possessing this newly identified form, the reader will succeed to grasp the universality hidden in these descriptions and the potentialities that they entail. This should permit to better understand the main features – exposed in III.4 – of the method of relativized conceptualization, constructed by *generalization* of the form first identified for, specifically, the descriptions of microstates. For it will be inside the general method of relativized conceptualization that in the subsequent chapters we shall be able to deal with the aporia of Kolmogorov.

Any knowledge that can be communicated without restrictions (like the restrictions involved in pointing toward, miming, etc.), is ***description***. A description involves by definition an *entity-to-be-described* (which in general is not also an "object" in the usual sense) and qualifications of this entity. The basic entities-to-be-described that are considered in fundamental quantum mechanics are what is a priori denominated 'states of microsystems' or in short *microstates*[2]. These are a class of *hypothetical* entities of which the existence is postulated beforehand on historical and methodological grounds, but that no human being could ever perceive. The construction, for entities of this sort, of qualifications endowed with some kind of stability, raises difficult and deep questions. Nevertheless fundamental quantum mechanics does exhibit qualifications of microstates. This means that a *strategy of description* has been at work, which has succeeded to overcome the epistemological difficulties. As announced, we want to explicate this strategy such as it emerges under the domination of, exclusively, the constraints imposed by the involved cognitive situation and the general human modes of conceptualizing.

Throughout what follows we are *obliged* to initially make use of the pre-existing structures of thinking and saying: If we refused to do so we could not *begin* to communicate about our investigation. We could not even begin to work it out for ourselves. However, notwithstanding this unavoidable classical rooting, the process of investigation will progressively induce several quite non-classical assertions of which the verbal formulation, though achieved in usual language, will nevertheless mark radical breaks with classical thinking. This can be regarded as one of the miracles of thought and language: the structure of the geneses is not necessarily the structure of the results, and this permits emergence of essential novelties. We shall make free use of this fact.

I.3.1. Microstates as 'entities-to-be-described'

Consider first the entities-to-be-described, the microstates. Since they cannot be perceived, it is not possible to make them available for study by just selecting them from some ensemble of pre-existing entities. Nor can one study entities of this kind by just examining observable marks spontaneously produced on macroscopic devices by admittedly 'naturally' pre-existing microstates: no criteria would then exist for deciding which mark is to be assigned to which microstate. The *unique* possible general solution has been identified to be the following one. First, to accomplish a *defined and* ***repeatable*** *macroscopic operation* that is just posited to generate a *given* though unknown 'microstate'; and *afterward*, to try to somehow manage to 'know' something about this supposedly generated microstate.

It will appear below how adventurous this approach has been.

So consider a macroscopically defined operation admitted to generate a 'microstate'. The first occurrence, here, of this word is written between quotation marks because in this initial stage of our

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[2] The stable micro-*systems* themselves (electrons, protons, neutrons, etc.) have first been studied in atomic and nuclear physics where they have been characterized by specific 'particle'-constants (mass, charge, magnetic moment). *Changes* of stable micro-*systems* (creation or annihilation) are studied in nuclear physics and in field-theory. *States* of stable micro-*systems* – 'microstates' – are specifically studied in *fundamental* quantum mechanics (for Dirac the word 'state', when it is made use of concerning microscopic entities, is short for 'way of moving' (dynamics)). Inside fundamental quantum mechanics the dynamic of microstates is characterized by distributions of values of 'dynamical state-*observables*'.

inquiry it is still *devoid of any definite content*. We know nothing on the content of a 'microstate'. It is just a void verbal box of which the a priori use is commanded by a general structural feature of our already accomplished conceptualization, according to which any 'thing' can only exist in some 'state': a *given* 'thing' is the *genus proximus* of all the 'states' of a 'thing', so a 'state' is an unavoidable specification of *this* 'thing'. According to the general structure of our languages-and-conceptualization the thing cannot be without some state and a state without the corresponding thing is nonsense. So a thing called 'micro-*system*' necessarily possesses 'states' according to the classical thinking. And quantum mechanics, acting inside the basic human structures of conceptualization, and in continuity with the macroscopic mechanics, has assigned itself the specific task of establishing knowledge on the *states* of microsystems, so of 'microstates'. Namely, knowledge cast in the pre-established *mechanical* terms, involving what is called 'position', 'momentum', 'energy', etc.

So the grids for the desired sorts of *qualification* of a microstate are equally posited *beforehand*, and quite *independently* of the considered microstate. And – with respect to ***these*** grids – a microstate to be studied emerges in general entirely unknown, still strictly non-qualified. This radical assertion is not in the least weakened by the use of the generic word microstate and of names of qualifications, since these verbal labels only insert a priori the *new* researched knowledge, into the general pre-existing structure of human conceptualization, without specifying any more singular content. In short:

> The microstate generated by a macroscopically defined operation emerges still strictly *non-specified, non-individualized* – neither 'mechanically' nor by some other sort of qualification – inside the a priori conceptual mould consisting of the general class of microstates.

However, accordingly to our current classical thinking again, the generated microstate *has* to be conceived as emerging somehow *relative* to the employed operation by which it has been generated. For if the assumption of such a relativity were refused, we would immediately fall in conflict with the pre-existing causal structure of the whole classical conceptualization, which on the other hand we have already deliberately decided not to violate *from the very start*, in order to insure intelligibility of the constructive action, for our own minds as much as for the minds of those with whom we want to establish communication and consensus. So – to begin with – we ***have*** to admit the relativity specified above, even if later, on the basis of already acquired results, we may decide retroactively to bring it into critical examination. But let us announce immediately that:

> From the *final* representation that will have been obtained for this very first stage of human conceptualization that we now are just entering upon, ***causality will have been ejected*** (MMS [2011], chapter 5), and this will not have introduced inconsistency, because the process of conceptualization itself and that what the result obtained by it designates, are radically distinct entities.

Furthermore, causality together with our general human laws of thought force us to conceive that the generated unknown microstate begins its existence in the spatial domain from the immediate neighbourhood of that where has found place the performed operation of generation (Kant has postulated that assignment of some spatial location to any perceived or even only conceived *physical* entity, is inescapably imposed by "an a priori form of human intuition", and this view, though many ignore it, has never been refuted).

Now, this notion that the microstate introduced by a given operation of generation is somehow relative to this operation, permits to *label* it: *this* microstate is a result of *this*, known, macroscopically defined operation of state-generation. Let us immediately embody this possibility. We symbolize by G the considered macroscopically defined operation of generation and we subject it to the condition of being *reproducible* in a communicable way. We denote by ms_G the corresponding microstate.

Though in this incipient stage the symbols G and ms_G are devoid of any mathematical representation, their introduction is of utmost importance: It installs inside the realm of the *communicable* the fact that the generated microstate, though it is entirely unknown from the point of view of the specific qualifications that are researched for it, is nevertheless made stably available for being 'studied'. In this sense it has been *captured*. For from now, by reproducing G, it is possible to produce as many 'copies' or 'replicas' of the microstate denoted ms_G as one wants, and each replica can be subjected to some subsequent operation of 'examination', while communicating clearly what is done, by words and signs. This, however involves a *posit*, namely that any realization of the operation G produces a replica of one and same microstate ms_G:

> *A microstate can be stabilized in the role of an entity available for being qualified via subsequent processes of examination,* ***if and only if one posits a one-to-one relation*** $\mathbf{G \leftrightarrow ms_G}$.

The question of the acceptability of such a one-to-one relation $G \leftrightarrow ms_G$ is far from being trivial and it has been very thoroughly examined elsewhere[3]. Here we just assert the conclusion that, in the considered cognitive situation, the posit formulated above simply is *unavoidable*. If it is not introduced one cannot *start* the desired construction of some knowledge concerning microstates. On the other hand, the consequences of the acceptance of this posit have appeared to be illuminating. So we do admit it, by a ***methodological decision*** that we re-express as follows.

> *That* which is obtained by any realization of the macroscopically defined operation of generation denoted G – ***whatever it be*** – is called *'the' microstate corresponding to G* (we stress the grammatical singular) and it is denoted ms_G.

Thereby we are now in possession of an *a-conceptual* specification – or 'definition' – of an unlimited number of replicas of the entity called '*the* microstate ms_G corresponding to G'; namely, a purely operational-factual specification of an entity still strictly *nonqualified* by singularities able to specify it inside the whole class labelled a priori by the word 'microstate'. Indeed G is not a qualification of ms_G. It is *only* the specification of the way of producing ms_G (if one knows how, say, a baby has been *produced*, this does not entail knowledge about the results of the various possible subsequent operations of qualification of that baby *itself*). But, though it does not qualify what is labelled ms_G, this sort of 'definition' of ms_G can be communicated and it can be made consensual. This is very remarkable: It finally circumvents the lack of any *predicate* that would permit to define a microstate in the usual, classical way. Indeed in classical conceptualization a definition is usually realized verbally-conceptually, by the help of predicates that both define *and* qualify at the same time (open a dictionary and seek, say, 'cat'. One finds (Webster, fourth edition of the Merriam series): «carnivorous domesticated quadruped….»).

So the initial extremity of the chain of information that was to be started, is now established on the basis of a methodological decision that *introduces a radical non-classical separation between putting an entity in the role of object-for-qualification, and subsequent possible operations of qualification of this entity*.

I.3.2. Qualifying a microstate emergence of a 'primordially' statistical and 'transferred' qualification

We can now enter upon the second stage of this approach, namely the stage of construction of knowledge concerning specifically the microstate generated by the operation G and denoted ms_G.

The general problems. Such as it emerges from the operation G, the microstate ms_G is not observable by man. So it has now to be brought to trigger some manifestations that are observable by human beings. This can be realized only by use of some macroscopic apparatus able to interact with the generated microstate ms_G.

The interaction, however, in general *changes* the initial microstate ms_G.

Furthermore, the observable manifestations produced by an interaction between a replica of ms_G and a macroscopic apparatus, consist of just some observable (visible, audible, etc.) marks *exhibited by the registering devices of the apparatus*, *not by 'ms_G'* ***itself***. These marks can only be conceived as

[3] Specifically for microstates, a very thorough argument can be found in MMS [2011]; and in *general* terms this question is examined with most detail and in all its stages in MMS [2006], but also in previous works ([2002A], [2002B], and before).

results of interactions between the studied microstate and an apparatus for qualifying this microstate, results ***transferred*** upon the registering devices of the apparatus.

Now, the transferred observable marks resulting from an interaction between a replica of the microstate ms_G and a macroscopic apparatus, do never trigger in the observer's mind some *qualia* permitting to directly 'feel' the *nature* of the qualifying aspect of which the apparatus has been designed to register a qualitative or numerical 'value' (as it happens when 'red' is perceived, which is directly felt to belong to the category of qualiae that is called 'colour'). Therefore the significance of the registered transferred manifestations in terms of a given value of a given qualifying quantity, has to be entirely *constructed* in some conceptual-operational way. This is far from being a trivial task.

Inside the mathematical formalism of quantum mechanics – which has been deliberately researched as a *mechanics* applicable to microstates – the classical mathematical definition of each qualifying mechanical quantity X_M has been re-expressed, mathematically again, via a formal prolongation of the classical definition. *But both the classical definition* ***and*** *its prolongation involve some* ***MODEL*** *of the classical concept of a 'mobile'*. And inside *infra*-quantum mechanics – in contradistinction to what *is* the case for fundamental quantum mechanics, as it will be stressed below – mathematical representations as well as models are deliberately banished, in order to bring into evidence the consequences entailed by, exclusively, the cognitive conditions and the general human ways of conceptualizing that are involved when a human being tries to construct knowledge concerning what is called microstates. Nevertheless we want to construct for microstates a representation of 'knowledge' that, though it is confined to a strictly qualitative character and is subjected to a strict absence of model, be comparable, when it is achieved, with the mathematical representations from quantum mechanics. So infra-quantum mechanics *must* somehow ***encompass*** the possibility to refer to 'mechanical' quantities, via some sort of particularization, when this is desired. How can this be realized without violating the severe conditions imposed upon this approach[4] ?

Consider a 'test'-operation ***X*** that is realizable on a microstate by the use of a macroscopic apparatus *A(**X**)* and each realization of which ends up by a 'transfer' upon the registering devices of *A(**X**)*, of a set $\{\mu_X\}$ of marks that can be directly perceived by the human biological sensorial systems[5]. The set of *all* such sets of transferred observable marks that are considered will be called *the spectrum of* ***data*** *corresponding to the test-operation* ***X***.

Let us now admit on the basis of conceptual and historical facts, that what is called a microstate ms_G is such that for any *mechanical* quantity *X* that has been defined inside the classical mechanics, there exists at least one test-operation ***X****(X)* which, *in some definite sense*, 'corresponds' to the classical mechanical quantity *X*, so that it can be regarded as an operational transposition applicable to microstates, of this classical mechanical quantity: this is a hypothesis of *mere* existence of an outworked connection between the mechanical quantity *X* and the test ***X****(X)*, that here is left *void of any other specification*. Nevertheless, on the basis of this minimal hypothesis of mere existence, the symbol ***X****(X)* points now in our mind toward a previously defined mechanical quantity *X*. On this hypothetical basis we can envisage to say that ***X****(X)* is a *mechanical test* and that ***X****(X)* can be considered to represent a 'measurement'-interaction *M(X)* of which the result indicates a *numerical* value *Xj* of the mechanical quantity *X*. But this, in order to be useful, must be associated with also a coding rule which transposes any set of observable marks $\{\mu_X\}$ produced by one realization on ms_G of the test ***X****(X)*, into *one* definite *numerical* value *Xj* from a set $\{Xj\}, j\in J$ of possible numerical values of *Xj* assigned to the quantity *X* tied with the test-operation ***X****(X)* (*J*: an index set, here discrete and *finite* by construction, for effectiveness).

So finally, *if-and-only-if* an appropriate conceptual-operational-methodological construct is actually achieved that realizes such a coding, we shall write indeed that ***X****(X)*≡*M(X)*, and the finite set

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4 In MMS [2011] (pp. 73-88) this very important problem is treated differently, with full rigor and detail, and it entails a result that later, via the confrontation of infra-quantum mechanics with the mathematical formalism of quantum mechanics, dissolves the central quantum mechanical interpretation problem, namely 'the problem of measurement' MMS [2012]. The presentation adopted here is only a *very* amputating shortcut.

5 In order to insure effectiveness it is supposed from the start that the number of the considered distinct sets $\{\mu_X\}$ is finite. This assumption is the only one that is practically realizable: Any numerical estimation performed on these marks, even if only concerning their space-time location, introduces *units*, so discreteness, and furthermore we are always confined to a finite number of tests.

of all the possible numerical values *Xj* obtained via the numerical coding of the sets $\{\mu_X\}$ of observable marks producible by the measurement-interaction *M(X)* will be called *the spectrum of the mechanical quantity X attached to test-operation* ***X****(X)*. Correlatively, *A(****X****)* will be regarded as an 'apparatus for measuring *X*'.

Suppose that all that has been required above is insured. Then, notwithstanding that we have proceeded under exclusively the constraints entailed by the cognitive situation and the human ways of conceptualizing, the process of construction of a strictly qualitative consensual knowledge on microstates, that deserve being called an infra-quantum *mechanics*, seems to be possible, and it can be continued.

Immediately however, the central condition of unambiguous numerical coding of the observable data produced by the test-operation ***X****(X)* raises a new obstacle:

> *The assumption of transpositions applicable to microstates, of classical mechanical qualifications like 'position', 'momentum', etc, necessarily involves some* **model** *of a microstate, even if only a very vague one.*

For without ***any*** such model – *nor any qualia* indicated by the sets $\{\mu_X\}$ of observable data – there would be no conceivable connection whatever between the 'mechanical' description of a microstate and the classical mechanical descriptions achieved via qualifying quantities that have been extracted by abstraction from the qualia carried by the directly observable motions of macroscopic bodies. So *it would not be possible to justify why some given sort of measurement-interaction M(X)≡****X****(X) is asserted to correspond to precisely this or that classical mechanical quantity X.* And indeed a careful examination shows that – contrary to the current orthodox assertion upheld by Bohr and others that quantum mechanics is free from any involved model – de Broglie's 'wave-corpuscle' model remained implicitly but quite organically incorporated in the quantum mechanical mathematical algorithms that represent an act of measurement) (MMS [2011] p. 77-80).

This organic connection between the definability of a measurement interaction *M(X)* and a model of microstate appears at a first sight as an insuperable obstacle inside an approach which, by the severity of the imposed constraints, interdicts not only mathematical representations, but also any specified model attached to the general concept of microstate.

However, we have been able to circumvent this difficulty also.

We have transcended it via a *general* ***frame****-condition* that permits to code any set of observed marks, by the use of *exclusively* the space-time locations of the marks: This permits to tolerate at the core of our approach *a* ***void*** *of specification of the semantic contents of the observable marks produced by the measurement-interactions M(X) tied with a test-operation* ***X****(X)* (MMS [2011] pp. 81-87). Like in the case of the measurement interactions themselves, such semantic specifications for the results of these measurement interactions are only posited to exist in some sense and on some level of conceptualization that remains to be specified later.

> The coding of the marks according to the general frame-condition mentioned above, only *individualizes mutually* any two given sets of observable marks, without specifying any semantic content, nor – a fortiori – any numerical value.

This suffices for permitting to continue to construct.

However, in order to furthermore justify this or that *denomination* in mechanical terms – "position"-measurement, "momentum"-measurement, "total energy"-measurement, etc. – chosen for a given operation denoted *M(X)*, it becomes *unavoidably* necessary, of course, to assume some model of a microstate, as it *does* happen indeed inside quantum mechanics, even if in a non-declared and implicit way. But we stress that:

> Acceptance of the existence of a model of a microstate, or even specification of such a model, *does not hinder a purely transferred character of the measurement processes*: The quantum mechanical measurements *are* – quite strictly – transfer-measurements, in this sense that they

produce exclusively marks observable on a registering device, that are devoid of any qualia relatable in a definite way with the studied microstate.

Once this has been stated, for direct comparability with the formalism of fundamental quantum mechanics, in what follows we shall consider mechanical tests ***X****(X)*≡*M(X)* tied with 'measurement' operations and leading to numerical values of mechanical quantities.

Emergence of a 'primordially' statistical level of conceptualization. We now ask the following question: Can a numerical value *Xj* that codes for a group $\{\mu_X\}$ of transferred observable marks produced by a measurement-interaction *M(X)* of the kind characterized above, be conceived to qualify the studied microstate itself?

The answer is obviously negative. According to our general causal structures of conceptualization, the measurement-interaction *M(X)* must be conceived to change in general the studied microstate ms_G, that one that has been initially created by the operation of generation *G*. (This is so for reasons of the same nature as those that obliged us already to conceive that what has been produced by a given operation of generation *G* is somehow relative to *G*). So the observable transferred marks have to be conceived to emerge indelibly relative to also the mentioned change, so relative to also the employed sort of measurement-interaction *M(X)*. It follows that the transferred marks characterize ***only*** *globally* the measurement-interaction, not *separately* the (hypothetical) studied microstate ms_G.

One can however cling to the fact that the observable marks are relative to *also* the initially created microstate ms_G. One has then to take into account that two clearly distinct processes of change of the initially produced object-microstate ms_G, corresponding to two clearly distinct measurement interactions *M(X)* and *M(X')* realized by use of two distinct apparatuses *A(X)* and *A(X')* tied with two different mechanical quantities *X* and *X'*, in general cover *two different space-time domains*. Now, when this happens, the corresponding measurement-interactions *M(X)* and *M(X')* cannot be both simultaneously achieved for ***one*** *single replica of a microstate* ms_G. So – in *this* sense – these two measurement interactions are *mutually incompatible*[6].

Furthermore, a measurement evolution destroys in general the micro*state* ms_G initially produced by the corresponding operation of generation *G*.

It follows that if one wants to obtain for the microstate ms_G observable qualifications in terms of values of *both* quantities *X* and *X'*, in general one has to generate *more* than only one replica of ms_G, because one has to achieve the two different sorts of successions

[*G.M(X)****]*** ≡ ***[****(a given operation G of generation of a microstate* ms_G*),(a measurement-interaction on* ms_G*)****]***

namely successions ***[****G.M(X)****]*** as well as successions ***[****G.M(X')****]*** (the chronometer being re-set at the same initial time-value t_O for each realization of a succession of this kind).

Furthermore, the measurement-interaction for only *one* quantity *X* and with a given microstate ms_G, when it is repeated via the corresponding succession ***[****G.M(X)****]*** in order to 'verify' its result, in general does *not* yield systematically one *same* value *Xj*. If this does happen for some given quantity *X*, then it does *not* happen for a quantity *X'* that is incompatible with *X* in the sense defined before: *This is a basic empirical fact of observation*. So, in general, the results are distributed over the whole spectrum $\{Xj\}, j\in J$ of possible values of *Xj* of the quantity *X* tied with the test operation ***X****(X)* (*J*: a discrete index set). So the global observational situation that emerges by measurement interactions with microstates is quite essentially *statistical*. And the nature of this statistical character is 'primordial' in this sense that it marks the *very first* sort of knowledge that can be generated concerning microstates (MMS [2007C] (in connection with Longo [2007])), so concerning matter. Therefore – on this primordial level of conceptualization – the statistical character cannot be assigned to mere ignorance of a more basic conceptualization that would have been achievable previously in individual deterministic terms, at least in principle (as it is always assumed in classical thinking concerning any

[6] The restriction to *one* replica of the considered microstate ms_G is not explicitly required inside the current presentations of the quantum mechanical concepts of incompatibility and of complementarity, though these concepts do involve it quite essentially.

sort of statistical data). Only by explicit models possibly constructible some day on a *higher* level of conceptualization than that on which emerge the primordially statistical transferred descriptions, could a fully non-statistical description of this or that microstate be worked out.

The chronology of the levels of conceptualization *begins* with a non removable, essentially, primordial statistical character.

The peculiar descriptional FORM tied with primordially statistical transferred qualifications of microstates. So the sort of *stability* that can be observed concerning a microstate – that one which can be researched on the primordial level of the conceptualization of microstates – can equally be only statistical. On this primordial level one can research a descriptional invariant only as a consequence of repetition, for each given pair *(G,X)*, of the same corresponding succession ***[****G.M(X)****]***. But *what sort of invariant can this be, exactly*? The first tendency is to answer: « a probabilistic invariant, a probability 'law' *{p(G,Xj)}, j∈J* tied with the pair *(G,X)* ». But this brings us back to the problem drawn into evidence in the chapter II, of the *absence* of a factual definition of the 'probability law' to be asserted in a given factual 'probabilistic situation', i.e. a definition that shall be *independent* from that one – non effective and indefinitely recessing – that is involved in the expression *(2)* of the weak law of large numbers.

> Kolmogorov's aporia that has emerged inside the classical thinking realizes its *most basic* manifestation when the concept of probability is tried to be made use of in connection with the study of microstates.

And it might come out that *inside* at the first-level conceptualization where the descriptions of microstates are originally worked out, the concept of probability is not constructible[7].

So *all* that, for the moment, can be factually achieved, is what follows. To realize for each studied pair *(G,X)*, a finite number *q* of series of *N* repetitions of the corresponding succession ***[****G.M(X)****]***, *N* taking on successively the values from some finite collection of increasingly large numbers *N1, N2,….Nk…Nq,* and to survey whether yes or not some tendency toward convergence does manifest itself for the relative frequencies from the corresponding sets *{n(G,Xj)/N}, j∈J*, *N=N1, N2,….Nk…Nq*.

Nothing insures a priori the existence of such a convergence. This existence is not a logical necessity. And if no convergence were found, one would be obliged to finally give up the aim to construct some stable observable knowledge concerning microstates.

But in fact it turns out that a tendency toward convergence ***does*** manifest itself, for any pair *(G,X)*; a fluctuating convergence, of course, as long as the integer *Nq* is kept definite, finite, effective. In these conditions, and given the confinement inside effective procedures that has been decided here, and the absence so far of any general procedure for constructing the factual probability law to be asserted in a given factual situation, one can only substitute some posit to the specification of such a law. For instance, one can posit that the relative frequencies from the set *{n(G,Xj)/N}, j∈J*, measured for the longest series of repetitions of the succession ***[****G.M(X)****]***, *Nq*, will be assimilated *by convention* to the unknown factual numerical distribution of individual probabilities. Which amounts to just *decide* to write *{n(G,Xj)/Nq}* ≅ *{p(G,Xj)}, j∈J*, i.e. to assign to the ratio *n(G,Xj)/Nq, j∈J* the role played in the weak law of large numbers by what, there, is denoted $p(e_j)$. Thereby one introduces concerning the microstate ms_G a sort of '*pre-probabilistic* knowledge' founded on a mere factually observed *tendency* toward convergence. Then this knowledge, under cover of the dense cloud of confusion that surrounds the concept of probability, is treated by hidden convention as a factual 'probabilistic' knowledge[8]. Namely, in this case, a pre-probabilistic qualification marked by *a non removable relativity to the involved triad* ***(****$G,ms_G,M(X)$****)***. This sort of transferred pre-probabilistic

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[7] Inside the mathematical quantum theory it is largely admitted more or less explicitly that the ***mathematical*** *formalism* involves the possibility to determine the ***probability*** law (not some statistical distribution) corresponding to ***ANY factual*** situation concerning a microstate. Historically, this view stems from what is called 'Born's algorithm' and possibly also from Gleason's theorem on 'probability' measures in a Hilbert space (Gleason [1957]). This view – that the present author does not share – will be briefly submitted to discussion at the end of this work.

[8] After all – for now and more or less explicitly – something of precisely this sort is systematically done in any classical probabilistic situation.

effective qualification, involving a conventional choice, will be called here *the transferred description of the microstate $ms_G \leftrightarrow G$ via the qualifying 'mechanical' transfer-view $V_M(X)$*, and will be denoted

$$\boldsymbol{D/G,ms_G,V_M(X)/}$$

This notation reminds explicitly of the genesis of the description and of the relativities that it involves ('mechanical' transfer-view $V_M(X)$ is just a new name and notation introduced for the measurement interaction $M(X)$). But we stress again that the description itself – the global qualification that has been obtained – consists of nothing more than the partially conventional pre-probability law $\{n(G,Xj)/Nq\}$ $\cong$ $\{p(G,Xj)\}, j\in J$ introduced above.

"Characterization" of a microstate. We have explicitly noted that the strategy imposed by the cognitive situation while constructing knowledge concerning microstates has led to qualifications that can be posited only to *involve* this microstate, but cannot be assigned to it alone, separately. This might seem to already violate the classical concept of description. So let us investigate whether at least the peculiar sort of knowledge constructed here and denoted $D/G,ms_G,V(X)/$**,** can be considered to be characteristic of the involved microstate ms_G, i.e. whether it can be considered to apply exclusively to the microstate ms_G. Now, the answer to this question is negative, in general: if – as it has been conceived above – $V_M(X)$ introduces only one quantity X, no reason can be found for asserting that the same pre-probability law $\{p(G,Xj))\}, j\in J$ that has been found for the studied microstate ms_G, so for the pair $(G,Xj))$, could never arise for also another pair (G',X) with $G'\neq G$ but with the same qualifying quantity X.

But if one considers that the considered mechanical view V_M introduces ***two** mutually **non** compatible measurement-interactions $M(X)$* and *$M(X')$* achieved *on different replicas of **one** same microstate ms_G*, then it seems safe enough to consider that these two distinct measurement interactions act like two distinct 'directions of qualification' which, together, by a sort of 'intersection', do determine a characterization of ms_G; i.e. that no other operation of generation that is different from G can generate a microstate for which exactly the same pair of pre-probability laws as those obtained for $ms_G \leftrightarrow G$ with $M(X)$ and $M(X')$, does emerge. All the more so, then, if all the mutually non-compatible pairs (G,X) are considered, where X runs over all the mechanical quantities redefined for a microstate: the set of all the pre-probability laws $p(G,X)$ corresponding to all these mutually non compatible pairs can quite safely be considered to express a specificity of the studied microstate ms_G. So we are led to introduce a general concept of a view V defined as a union of aspects, namely of mechanical aspects, in our case. Let us denote this general concept of a mechanical view by V_M and call it *the global mechanical qualifying view defined for microstates* consisting of the union $V_M=\cup V_M(X)$ with X running over all the qualifying mechanical quantities defined for microstates. Then *the pre-probabilistic transferred mechanical description of the microstate ms_G* (mind the singular) can be denoted by the symbol

$$D/G,ms_G,V_M/$$

Thereby the initial descriptional form $D/G,ms_G,V(X)/$ that cannot be considered yet to fully characterize one given microstate, has been completed into a relativized description $D/G,ms_G,V_M/$ by which such a characterization is achieved.

We can now conclude in the following terms: A transferred description of a microstate ms_G consists of, exclusively, a set of one or several partially conventional 'pre-probability distributions' on groups of observable marks $\{\mu_X\}$ transferred on (in general) *various* registering devices of various apparatuses, and expressed via definite coding rules in terms of values Xj from spectra of qualifying mechanical quantities X.

> *Such a description asserts strictly nothing concerning how the microstate ms_G 'is' **itself**, nor even WHERE and WHEN it 'is'.*

So, in order to create knowledge concerning microstates, we have made use of the pre-existing general features of our human conceptualization, and these, quite fundamentally, involved in particular acceptance of causality (when we have posited the relativity of ms_G to G, and the relativity of the observable marks $\{\mu_X\}$ to both ms_G and $M(X(\mathbf{X}))$. And *notwithstanding this, the final result is a descriptional form* $D/G,ms_G,V_M/$ *that does not even assign a connected space-time support to the studied microstate* ms_G *by its transferred description.* This break with classical thinking has been brought forth progressively, via unavoidable steps required by the conditions that have successively arisen in order to succeed to define the entity-to-be-described and qualification of this entity; which means, in order to describe it; which in its turn is strictly synonymous to creating communicable knowledge concerning this entity.

The absence of a definite and connected space-time support *of a studied microstate* – not of the transferred observable marks tied with it – together with the involved coding of these marks stripped of any semantic content tied with the described microstate, make the concept of a transferred description $D/G,ms_G,V_M/$ utterly non-classical and ***unintelligible***. Thereby this sort of description triggers a violent need for values of qualifications involving qualia that can be conceived to be 'possessed' by ms_G inside some connected space-support covered by ms_G. But this sort of 'explanation' the primary transferred description of a microstate requires an explicit and declared model of a microstate, and this requirement ejects out of infra-quantum mechanics. It equally ejects out of fundamental quantum mechanics. There however, outside these primordial representations, nothing hinders to construct such a model[9].

The global space-time tree-like structure of the transferred description of a microstate. Let us come back now to the mutual incompatibility of the evolutions of two measurement processes that cover different space-time domains and thereby exclude a simultaneous realization on *one* single replica of the microstate ms_G. Such mutual space-time incompatibilities entail that the set of *all* the physical successions ***[****G.M(X)****]*** that involve one *same* operation of generation G, falls apart into a subset of *mutually in-compatible classes* of *mutually compatible successions* ***[****G.M(X)****]***. This, by a 'geometrizing' process of integration, brings forth a pre-probabilistic whole of a *new* type: *a tree-like space-time structure* founded on one common 'trunk' corresponding to the space-time domain $d_G(t_G\text{-}t_o)$ covered by the realizations of the operation of generation G, and possessing as many measurement-interaction 'branches' as there are mutually incompatible classes of mutually compatible operations of the considered sort, each branch covering a specific space-time domain and generating on its top a corresponding Kolmogorov-type pre-probability space[10]. We shall call this structure *the pre-probability tree of the pair* (G,V_M) and denote it by the symbol $T(G,V_M)$. The fig.1 represents an example with only two branches corresponding to only two quantities re-noted for simplicity $X\equiv B$ and $X\equiv C$ and topped by, respectively, the two pre-probability spaces

$$[(C1,\ C2,\ C3,...Ck,...Cm),\ \ p(G,C)] \text{ and } [(B1,\ B2,\ B3,....Bj,...),\ \ p(G,B)]$$

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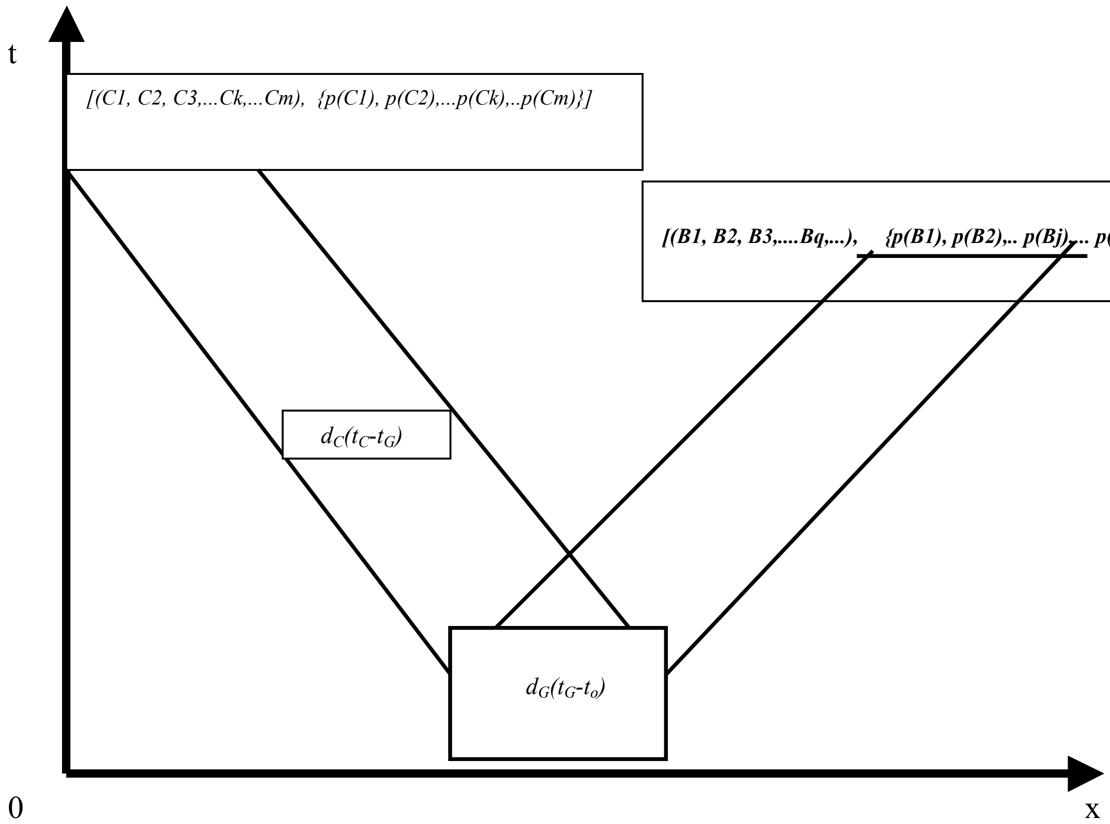
[9] The theorems of 'impossibility' that claimed to eliminate the constructability of any such normal, causal, space-time model, have been invalidated by the present author (MMS [1964], [1979]).

[10] These space-time specifications from the 'geometrizing' integration of the *genesis* of a transferred *description* $D/G,ms_G,V_M/$ do not in the least alter the fact that any *own, intrinsic* space-time specification *of the microstate* ms_G, is lacking.



Probability tree *$T(G,V_M(B,C))$* of a pair *$(G, V_M(B,C))$* where *$V_M(B,C)$* involves only two mechanical aspects *B* and *C*.

(The algebra on the universes of elementary events *(C1, C2, C3,...Ck,...Cm)* is skipped for the sake of simplicity and the pre-probability law *{p(G,C)}* is defined directly on the universe of elementary events; *mutatis mutandis* the same is done for the universe *(B1, B2, B3,....Bj,...)* and *p(G,B)*).

I.3.3. Necessity of a deepened and extended general theory of probabilities

We have shown elsewhere that the qualitative descriptional form $D/G,ms_G,V_M/$ with the tree-like space-time structure $T(G,V_M)$ of its whole integrated, 'geometrized' genesis, introduces a number of characters that *overflow* Kolmogorov's classical concept of a probability space, quite essentially and in several important respects[11], namely: full *representation* of the structure of the involved random phenomenon; meta-'probabilistic'-dependence between the events from the mutually *incompatible* probability spaces that top the branches (accepting a specific mathematical representation, not singularized before inside the general concept of correlated probability spaces); pre-organized receptivity for also the logical aspects of the set of all the involved elementary events and events, whether compatible or incompatible, and that come out ***not*** to be expressible by a lattice structure). Thereby the concept of pre-probability tree of the pair (G,V_M) calls for an extended and deepened concept of 'probability' *unified* with a corresponding logic of all the involved events.

This has been partially achieved in MMS [1992A], [2002A], [2002B], [2006], in terms *generalized* to any relative description[12].

[11] The detailed examination of the concept of the pre-probability-tree of a microstate brings forth several deeply non-classical aspects (MMS [2011] (pp. 119-131))

[12] In this work we try to insure a *non-restricted* generalization, but only inside the classical domain of thought. The problems that concern specifically the primordial domain of conceptualization on which the basic descriptions of microstates are constructed, will be clearly formulated in the last chapter.

I.3.4. Conclusion on infra-quantum mechanics (IQM)

The descriptional form *D/G,*ms_G*,*V_M*/* with the geometrized, integrated tree-like space-time structure of its genesis and with the consequences of this structure, is the heart of the strictly qualitative, physical-epistemological sort of representation of microstates that we have constructed *independently* of the mathematical formalism of quantum mechanics and have called *infra-quantum mechanics*, in short *IQM* ('infra' is to be understood here as: *beneath the mathematical formalism and partially encrypted in it*).

Here infra-quantum mechanics has been only sketched out in an extremely simplified way. But when it is exposed in full detail *it brings into light the whole way in which the quantum theory manages to* ***signify***. In particular, it permits to separate inside quantum mechanics that which has been introduced there by a prolongation of classical models aimed toward the construction of, specifically, a *mechanics* of microstates, from what has been induced there exclusively by the cognitive situation, by the general requirements of human conceptualization, and by the aim to construct knowledge concerning microstates.

It is striking that, notwithstanding the elements of classical models encrypted in its formalism, *the descriptions themselves that are involved in the mathematical quantum theory are* ***transferred*** *descriptions of the form D/G,*ms_G*,*V_M*/ identified inside IMQ, involving the tree-like space-time structure T(G,*V_M*)*: These descriptions do not at all concern overtly the model of a microstate that is implicitly involved by the formalism. These descriptions are explicitly connected exclusively with the observable marks produced by the measurement interactions. The model has been digested by the formalism, assimilated in it. This sort of epistemological schizophrenia of the quantum mechanical formalism fuels the capacity to offer formal definitions of *mechanical* quantities (via eigenstate-equations and the corresponding eigenvalues) and to imagine corresponding adequate measurement operations. But on the other hand these actions of a deconstructed, not perceivable model, is strongly tied with the unintelligible character of the formalism.

A systematic comparison between infra-quantum mechanics and the mathematical formalism of quantum mechanics should now permit to deal in a *unified coherent* manner with *all* the interpretation problems, and to achieve an organized dissolution of these.

But this remains exterior to the present context. The own aim of the present work is to identify in an effective manner the factual probability law to be asserted in any given factual probabilistic situation. now, from the chapter II and from what precedes inside this chapter III it appeared that the problem of defining an effective factual probability law in any given probabilistic situation, stays open at least as much in the case of the primordially statistical transferred descriptions of microstates that lie at the basis of the whole nowadays physical knowledge, as in the classical domain of probabilistic thinking. And it is precisely by the use of a generalization of the descriptional form *D/G,*ms_G*,V/* (that inside infra-quantum mechanics has been constructed only for the particular case of microstates) that we shall be able to propose a solution to Kolmogorov's aporia. In order to introduce now this generalization, we shall first bring into evidence a certain universal character involved by the descriptional form *D/G,*ms_G*,V/*.

I.4. Universality and perception of the possibility of a *general* method of relative conceptualization

So, to achieve a transferred description *D/G,*ms_G*,*V_M*/* of a microstate it is necessary to:

(a) Achieve the physical epistemic operation denoted *G* that introduces a corresponding entity-to-be-described ms_G, *independently* (in general) of any epistemic action by which this entity could be qualified.

(b) Achieve the measurement-interactions *M(X)* that lead to qualifications of the entity ms_G.

(c) Realize both operations *G* and *M(X)* in a radically *creative* way, by *first* generating – physically, in space-time – an entity-to-be-described that did not pre-exist (instead of just *selecting* it among already available physical objects) and by *afterward* generating, physically again, observable manifestations of ms_G (instead of just *detecting* 'properties' supposed to pre-existing and to be 'possessed' by this entity).

(d) Realize a big number of times each succession ***[G.M(X)]*** for each quantity *X* involved by the utilized view V_M, in order to try to reach – on the level of observable manifestations of ms_G that arise irrepressibly with a statistical character –*invariants* able to constitute a sufficiently stable qualification that be characteristic of ms_G.

The points *(a)*-*(d)* summarize a maximally *displayed* and *creative* way of achieving descriptions, where all the involved relativities become apparent in succession, are active and obvious, so that the resulting final description $D/G,ms_G,V_M/$ is explicitly relative to each one of the elements of the triad (G,ms_G,V_M)[13].

The descriptional form $D/G,ms_G,V_M/$ *with its non-removable relativities, its genesis dominated by methodological decisions, and its epistemological consequences (MMS [2002A], [2002****A****] [2006]), [2011], [2012]) constitute a crucial insight into the knowledge of the way in which man generates knowledge.*

It is crucial to realize that the degree of display and creativity that characterizes the genesis of the descriptional form $D/G,ms_G,V_M/$ is ignored in most of our current classical conceptualizations such as they are reflected by the natural languages as well as by classical logic, classical probabilities and classical physical theories, Einstein's relativistic theories included. In the classical conceptualizations it has always been possible to suppose more or less implicitly that the considered entities-to-be-described *pre-exist* to the descriptional process and are 'defined' in advance by 'properties' that these entities 'possess' *intrinsically*, independently of any act of examination, and in an already *actualized* way. As long as the peculiar aim of describing microstates had not yet been conceived, these suppositions had never led to remarked difficulties. Therefore, classically, a description is conceived to consist exclusively in the *'detection'* of one or more among the 'properties' that are 'possessed' by the entity-to-be-described that, itself, is conceived to pre-exists either as an 'object' in the usual sense, or as a 'situation', event, etc.

The question of how an entity-to-be-described is introduced as such, ***is entirely skipped****.*

As for the process of examination that creates a qualification of this entity, it is contracted into one static act of mere detection. This last classical contraction is the source of the nowadays most explicitly stated differences between the logic and probabilities involved by the descriptions of microstates, and on the other hand the classical logic and probabilities. But the very deep consequences of the way in which an entity-to-be-described is *generated*, are quasi systematically ignored[14].

It is however noteworthy that, though in classical logic and probabilities – the two most fundamental classical syntactical structures – the descriptional form $D/G,ms_G,V_M/$ is not apparent, this form nevertheless is quite obviously involved in many *current* classical epistemic procedures. Indeed, once one has clearly perceived the peculiar and very difficult cognitive situation dealt with for describing microstates, as well as the descriptional strategy that permitted to dominate this difficult cognitive situation, a very paradoxical inversion arises, by a sudden variation that reminds of those which make appear certain drawings of a cube as sometimes convex and sometimes concave. What first, in $D/G,ms_G,V_M/$, had seemed to be fundamentally new and surprising, abruptly appears now on the contrary as endowed with a certain sort of universality, so of normality. Indeed it leaps to one's mind that:

* Any explicit and full account of a given process of description *has* to include specification of the action by which the entity-to-be-described is introduced *as such*, as well as specification of the operation, physical or abstract or both, by which a qualification is obtained for this entity.

* Often the two actions mentioned above are mutually independent.

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[13] It might seem at a first sight that the relativity to ms_G can be absorbed in that to *G*. But it then appears that this cannot be done: the results of the successions ***[G.M(X)]*** depend explicitly on ms_G and ***they cannot be derived from G***.

[14] This is so even in fundamental quantum mechanics: There, for verbal reasons, many physicists identify erroneously the operation *G* of generation of a microstate, with what is called 'preparation' of the microstate, that in fact is involved only in the operation of qualification of that microstate via *measurement*-interactions ('preparation' *for measurement registrations*). This means presupposing that, like a classical 'object', the microsystem to be qualified is already there. In any case, the operations of generation of microstates are *not* mathematically represented inside the formalism.

* The introduction of the entity-to-be-described is sometimes achieved by *creation* of this entity, while the operation of qualification, if it is a *physical* process, *always* – in principle at least – *changes* the object-entity, and sometimes it changes it radically, in which cases the consequences of the relativity to one or the other or to both these basic epistemic actions, upon the obtained description, have to be explicitly taken into account and thoroughly analyzed.

For instance, think of a detective who is searching for material indications concerning a crime. What does he do? He usually focuses his attention on a convenient place from the physical reality, say the theatre of a crime, and there he first operates extraction of some samples (he cuts out fragments of cloth, he detaches a clot of coagulated blood, etc.); he might even entirely create a test-situation involving the suspects and insure registration of their behaviour. Only afterward does he examine the gathered samples or, respectively, the behaviours registered during the test-situation.

One can equally think of a biopsy for a medical diagnosis, or an extraction of samples of rock operated by a robot on the surface of another planet, and the subsequent examinations of these entities-to-be-described. In all these cases the observer-conceptor – more or less radically – *generates* an entity-to-be-described that did not pre-exist in the desired quantity or state, in order to qualify it later by operations that are quite independent of the operation that has generated these entities. And in certain cases the operation of examination so radically changes the entity-to-be-described, that, if several different examinations of this sort of entity are necessary, also several 'replicas' of it must be produced, that are just posited to be mutually 'identical'. Furthermore, the obtained qualifications arise marked indelibly by two quite distinct relativities: relativity to the way of generating the entity-to-be-described, and also relativity to the sort of examination that has been achieved. Even the concept of relative existence or inexistence comes in: the way in which the entity-to-be-described has been generated can simply exclude certain subsequent examinations.

These considerations call forth the following remarks.

The nature and realm assigned by classical thinking, to communicable knowledge, are misleadingly reduced. The whole primordial zone of conceptualization where mind *actively constructs* out of pure physical factuality the very first forms of a radically new communicable knowledge, is so deep-set, that it remained hidden beneath the two basic building blocks of all the current occidental languages, namely subjects and predicates. These do both suggest available, pre-existing elements for describing. But furthermore, the primordial, always radically creative primordial zone of conceptualization, remained cut off even from many classical *scientific* representations. Notwithstanding the well known analyzes of Husserl, Poincaré, Einstein, Piaget, and many others, that have drawn attention upon the crucial role played by physical operations in the most basic processes of conceptualization, the classical logic and probabilities as well as the theory of sets, take their start from *language* and are developed by use of – quasi-exclusively – *language* again. Physical operations are not considered. And factuality – via language – is widely supposed to *spontaneously* imprint, upon *passively* receptive minds, 'information' concerning already existing and actual properties of pre-existing 'objects'. *The* ***active*** *role, when it does come in, is assigned quasi exclusively to the exterior factuality, not to the mind.*

But quantum mechanics – by having led via infra-quantum mechanics to the identification of the *basic, relativized descriptional form* $D/G,ms_G,V_M/$ – brought forth for the very first time the potentiality of a most deep-set, ***general*** and radically operational, *method of relativized conceptualization*. Indeed, the descriptional form $D/G,ms_G,V_M/$ is paradigmatic. It has captured in it a particular embodiment of an extreme epistemic situation that is universal. Namely the situation that arises each time that a communicable and consensual representation is researched concerning some *non* pre-existing physical entity of which – a priori – only the possibility is conceived and labelled, and which, if it is generated, emerges in a non-perceivable state. In such extreme circumstances one is *compelled* to a radically active, constructive attitude, associated with a maximal decomposition of the global process. For in such a situation, all the stages of the desired description have to be *built* out of pure physical factuality, independently of one another, each one in full depth and extension. The severity of these constraints revealed a descriptional form $D/G,ms_G,V_M/$ that, though it concerns the case of the microstates, is nevertheless endowed with a universal epistemological content so exhaustive and explicit that it authoritatively imposes the idea of the possibility of a generalization able to lodge inside it *any* form of description.

So a new aim acquires definition: To erect a general, consensual, canonical method of relativized conceptualization, *MRC*.

II. Telegraphic information on the *MRC*-approach

II. 1. Preliminaries

Quasi systematically, false absolutes are found to generate false problems and paradoxes that hinder the understanding and block the elaboration of knowledge. The history of thought swarms with examples. The specific goal of *MRC* is:

> *To offer a structured system of norms for conceptualizing in a* ***relativized*** *way that excludes by construction the possibility of emergence of false problems or paradoxes*.

The germ of *MRC* has been the peculiar qualitative form of the primordial descriptions of microstates that this author has first fuzzily perceived *beneath* the mathematical formalism of fundamental quantum mechanics, and then has constructed explicitly, quite independently of this formalism, inside the epistemological-physical discipline baptized *infra-quantum mechanics* (MMS [2011].

The construction of *MRC* has been started from zero, long *before* the explicit construction of infra-quantum mechanics where the germ of *MRC* can be contemplated and understood. This general method has been developed in a *deductive* way, in the sense of current (non-formalized) logic. The germ of *MRC* mentioned above re-emerges inside *MRC*, but only in a rather advanced stage and directly with a status of full generality. The epistemological strategy perceived more or less implicitly beneath the mathematical formalism of quantum mechanics played the role of a guide. Then, once constructed, *MRC* guided the explicit construction of infra-quantum mechanics.

Such are the intricate zigzags that work inside human minds.

The systematic relativizations successively introduced along any chain of descriptions that leads from a zero-point of conceptualization – a basic transferred description – to a piece of conceptualization no matter how complex, protect from *any* surreptitious insertion of false absolutes.

On each trajectory of conceptualization and for any descriptional cell from it, no matter how 'simple' or 'complex' it is, these relativizations reproduce, like a fractal character, a same recurrent basic descriptional *form* symbolized by the writing $D/G,œ_G,V/$: *MRC* generates hierarchical *chains* of mutually connected relativized descriptions of the form $D/G,ms_G,V/$.

These chains meet in node-descriptions and form descriptional nets.

In particular, *MRC* has generated a relativized reconstruction of natural logic, of the probabilistic conceptualization, of the informational conceptualization, and *it has led to a representation of 'complexities' where the semantic contents are fully preserved*. It also has permitted a representation of ‘time’ drawn from *a*-temporal elements. (Cf. (MMS [2006])).

We now continue by a mere *enumeration* of the main concepts from *MRC*. The connective considerations and the comments are filtered out. Thereby the semantic the logical features that express the character of necessity of the constructive process and unite the elements of *MRC* into an organic whole are suppressed here, thus leaving place for a certain impression of arbitrariness. Furthermore, the semantic contents are chopped apiece, which destroys the perceptibility of the flux of their growth during the construction. Only reading of other expositions of *MRC* (mainly MMS [2006] (that is available only in French), but also [2002B] and even [2002A]) can convey the perception of *MRC* as an intimately and rigorously constructed unity of factual contents and rationality. Nevertheless what follows suffices for curving out the ways toward a dissolution of the aporia of Kolmogorov.

II.2. Enumeration of basic MRC concepts

(1) *Any MRC-description is explicitly relative to a given triad* $(G, œ_G, V)$ where:

*[1] G denotes the *operation of generation* – physical, or abstract or consisting of some combination of physical and abstract operational elements – by which the entity-to-be-described is made available for being qualified. The specification of G is required to include an explicit indication of the domain of reality R_G on which G is applied.

*[2] $œ_G$ denotes the *entity-to-be-described* itself introduced by G. This entity can be directly perceptible, or ***not***.

*[3] *A one-to-one relation* $G \leftrightarrow œ_G$ *is posited between the operation of generation G and the entity-to-be-described* $œ_G$ *that is introduced by G.*

This relation is not a fact it is a ***methodological posit***. (Very careful analyses have brought forth that this posit is inescapably necessary and entails major conceptual consequences (MMS: [2006] pp.61-66, pp. 213-221 and [2011])).

*[4] V denotes the *view* by which the object-entity is qualified.

(2) The description that is relative to a *given* triad $(G, œ_G, V)$ is denoted by the symbol $D/G, œ_G, V/$ where *that* triad is introduced.

(3) Any view V is endowed by definition with a strictly prescribed structure, namely:

*[1] A *view V* is a *finite* set of *aspect-views Vg* where g is an aspect-index: $V = \cup_g Vg$, $g = 1, 2 ... m$, with m a finite integer.

*[2] An aspect-view *Vg* (in short: an aspect *g*) is *a semantic dimension of qualification* (colour, weight, etc.) able to carry any *finite*[15] set of 'values' *gk(g)*[16] of the aspect *g* that one wishes to consider (for instance for 'colour' one can choose to consider only the 'values of colour' indicated by the words 'red', 'yellow', 'green', *to each one of which is associated a sample*; the symbol *gk(g)* functions like a *unique* index different from *g* alone; in any definite case the indexes *g* and *gk(g)* can be replaced by any other pair of convenient signs). An aspect-view *Vg* is defined *iff* are defined all the devices (instruments, apparatuses) as well as all the material or abstract operations on which is based the assertion that an examination of a given object-entity via the aspect-view *Vg*, has led to this or that – unique and definite – value *gk(g)* of *g* (if not *none*).

*[3] A view *V* is a finite ***filter*** for qualification: *with respect to aspects or values of aspects that are not contained in it by its initially posited definition, a given view V is blind: it simply does not perceive them*.

*[4] The qualifications of space (*E*) and time (*T*) are achieved via a very particular sort of *frame-views V(ET)* (reducible, if convenient, to only a space-frame-view *V(E)* or only a time-frame-view *V(T)*).

The features enumerated above generate a concept of 'qualificator' very distant from the 'predicates' from the classical formal logic and from the grammars of current languages.

(4) Given a pair *(G,Vg)*, the two epistemic operators *G* and *Vg* can *mutually exist*, or *not*.

*[1] If any examination by *Vg* of the entity-to-be-described $œ_G$ introduced by the generator *G* does produce one well defined result *(gk)*, then the aspect-*value (gk)* of *g* does exist with respect to *G*, i.e. there is *mutual existence* between *G* and *(gk)*; hence, *a fortiori*, there also is mutual existence between

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[15] By construction, every counting or numerical character involved in *MRC* is finite: *MRC* is conceived as a strictly effective method. Inside *MRC* any sort of infinity can be understood only in terms of *relativized* ***absences*** *of a priori limitation*.

[16] We write *gk(g)* in order to be able to distinguish between aspect-values of different aspects and to assign to the set of value-labels *k=1,2,...* cardinals *w(g)* that depend on *g*.

the *aspect g* itself and the operation of generation *G*. In *this* case the pair *(G,Vg)* constitutes a *one-aspect epistemic referential*. This means that in this case, if one applies to the object-entity $æ_G$ introduced by *G*, an examination by *Vg*, so if one produces the operational succession *[G.Vg]*, then one *might* obtain a corresponding 'description" of $æ_G$ via the grid for qualification introduced by the aspect-view *Vg*. This happens indeed only if by repetitions of the succession *[G.Vg]* there does emerge some *invariant* result, either an individually invariant result, or some statistical stability, or a 'probabilistically invariant' result (but what exactly 'probabilistically invariant' means *factually* is precisely what remains to be specified in this work).

Mutual existence of an operation of generation *G* of an entity-to-be-described $æ_G$, and an aspect-view *Vg*, is the *MRC*-expression of the fact that the aspect *g* has emerged by abstraction from a class of entities to which $æ_G$ does belong.

*[2] If on the contrary, what is defined to be an examination by *Vg*, when applied to the object-entity $æ_G$, yields no definite result, then there is *mutual* ***in****-existence* between *Vg* and $æ_G$ ($æ_G$ does not exist relatively to *Vg* and *vice versa*) (for instance, a song does not exist with respect to the grid for qualifying in terms of intensity-values of an electrical current via an ampermeter, and *vice versa*). In this case an initial tentative matching *(G,Vg)* has to be eliminated *a posteriori* as unable to generate a relative description $D/G,æ_G,Vg/$ so as non significant from a descriptional point of view.

Mutual inexistence between $æ_G$ and *Vg* is the *MRC*-expression of the fact that the entity $æ_G$ does *not* belong to the class of entities that have contributed to the construction of *Vg* by a process of abstraction. So:

> *The pair of concepts of mutual existence and mutual inexistence constitutes the MRC-expression of the fact that* ***a qualification can be applied only to the entities that have participated to the genesis of this qualification*** *(individual or social)*.

*[3] These considerations can be extended in an obvious way to also any pair *(G,V)* where $V=\cup_g Vg$, $g=1,2...m$ contains a finite number *m* of aspect-views *Vg*. In this case one speaks of the possibility, or not, of an epistemic referential *(G,V)*.

(5) *The space-time frame-principle*. Consider a space-time view denoted *V(ET)*. It is called a *space-time* ***frame****-view* in consequence of the following principle that concerns only *physical* object-entities.

> *Any* ***physical*** *entity-to-be-described does exist relatively to at least one aspect-view Vg that is* ***different*** *from any space-time frame-view V(ET); it is non-existent with respect to any space-time frame view V(ET) considered* ***alone****, separately from any aspect-view Vg that is different from any space-time aspect ET.*

In order to insure place for expression of the space-time frame-principle and its consequences, the view *V* from any epistemic referential *(G,V)* able to generate a description of a physical entity-to-be-described, includes by convention a space-time frame-view *V(ET)* as well as at least one aspect-view *Vg* different from any space-time aspect[17]. In particular *V(ET)* can be reduced to exclusively a space-frame-aspect *V(E)*).

(6) Consider a pair *(G,Vg)* where *G* and *Vg* do mutually exist. So the pairing *(G,Vg) does* constitute an epistemic referential where it is possible to construct the relative description $D/G,æ_G,Vg/$ of the entity-to-be-describe $æ_G$ produced by *G*.

*[1] If after some number *N* of repetitions of the succession *[G.Vg]*[18] only *one* and the same value *(gk)* of the aspect *g* is systematically obtained, the corresponding relative description $D/G,æ_G,Vg/$ is

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[17] One can construct infinitely many space-time frame views, via various choices of axes of reference or origins of these, or various choices of differential geometric structures of reference (like Riemann geometry, for instance), or via various choices of space units and time units.

[18] In *general*, after a succession *[G.Vg]* the replica of the object-entity $æ_G$ involved in that succession either is changed by the examination via *Vg*, or it is destroyed (absorbed in a device, etc.). So in general ***repetitions*** of *[G.Vg]* require repetitions of also the generation operation *G* (creation of a new replica of $æ_G$).

said to be an '*N-individual' one-aspect description* (or an 'individual description' relatively to *N* repetitions of *[G.Vg]*), *N* being *finite*). So inside *MRC*, in order to include the case of entities to be described that are 'consumed' by an examination via *Vg*, and 'individual description requires repetitions of the operational succession *[G.Vg]* and is relative to the number of these repetitions.

*[2] If on the contrary the obtained value *(gk)* in general varies from one realization of the succession *[G.Vg]* to another one, the corresponding relative description $D/G,æ_G,Vg/$ is said to be a *non*-individual description. In this case, via a very large but *finite* number *N'* of *series* of *N* repetitions of *[G.Vg]*, one can -- with respect to explicitly defined criteria of 'precision' – discern some *'(N-N')-stability*, it will be said that $D/G,æ_G,Vg/$ is a *'(N-N')-stable statistical description*[19, 20].

*[3] If, even-though *G* and *Vg* had been initially found to mutually *exist*, no sort of stability is finally found, neither individual nor statistical, then we say that a description $D/G,æ_G,Vg/$ corresponding to this pair does not 'exist' and the epistemic referential *(G,Vg)* is discarded a posteriori.

*[4] All the preceding assertions can be generalized to the case that the utilized view *V* contains more than only one aspect-view *Vg*: one has then to realize – separately in general – repetitions of *all* the sequences of operations *[G.Vg]* for *all* the aspect-views *Vg* from *V*. Exclusively the whole of all the final *qualifications* thus obtained will be said to constitute the obtained description $D/G,æ_G,V/$ itself: by definition, the triad $(G,æ_G,V)$ from the symbolization of the obtained description is not included in the obtained description, it only reminds of its genesis. And, again by definition, the description itself 'exists' only if some stability does manifest itself with respect to *all* the involved aspect-views. But the degree of stability is permitted to vary with *Vg*, so it is relative to *Vg*. So, like a description $D/G,æ_G,Vg/$, a description $D/G,æ_G,V/$ also can be found to be either an individual relative description or a statistical relative description (then endowed with some *'(N-N')-stabilities'*).

*[5] Consider now a description in which the operation of generation creates an entity-to-be-described that has never been examined before and of which the observable manifestations – for some non-restricted reason – cannot be *directly* observed (for instance, the chemical structure of a sample of rock dislocated by a robot sent on the moon that is equipped with apparatuses able to identify chemical structure and to transmit the result on a computer screen from an laboratory on earth-laboratory). The descriptions of this sort form *the primordial stratum of the human conceptualizations of physical reality*. The qualifications produced by a description from this primordial stratum consist exclusively of observable marks 'transferred' via 'measurement interactions' on registration devices of measurement apparatuses. A description of the specified kind is called a *basic transferred description*[21].

*[6] Inside a relative description $D/G,æ_G,V/$ the 'generator', the 'entity-to-be-described, and the view, *are **not** fixed entities, they are descriptional **ROLES*** freely assigned by the observer-conceptor, accordingly to his own descriptional *aims*, to this or that available physical or conceptual element*: the entity that in one description holds the role of the view, can be put in another relative description in the role of entity-to-be-described, or of operation of generation*. This sort of freedom – characteristic

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19 So inside *MRC* a 'statistical' description is endowed by definition with some *(N-N')-stability*. This distinguishes it from the current notion called 'a statistic' that does not involve repetitions, nor stability of any sort. This should be kept in mind throughout what follows.

20 A *'(N-N')-statistical description* can at most 'point toward' a 'probabilistic' description $D/G,æ_G,Vg/$ (*MMS* [2006], proposition π13). But the specification of the conditions in which a *factual* 'probabilistic' invariant associated with the epistemic referential *(G,Vg)*, does 'exist' and furthermore can be identified by some effective procedure, is precisely the aim of this work. As long as such a procedure is not yet identified we shall only speak of *statistical* descriptions endowed with *(N-N')-stability*.

21 We recall that when a microstate is the entity-to-be-described, the observer can ***never*** perceive this entity itself. As for the observable marks of which this basic transferred description consists, though the *observer* perceives these registered on a device that *is* endowed with a space-time support, they carry no sort of information whatever concerning the *own* space-time location of the physical entity that is qualified. Therefore *the basic transferred descriptions of microstates stay in a **radical** disagreement with the space-time frame-principle*. This is tied with the strange, unintelligible character of the descriptions of microstates, that generates an imperious need for a normal space-time representation (model) able to 'explain' the registered marks: The basic transferred descriptions of microstates yield the most extreme realization of the concept of basic transferred description. But this concept can also apply to macroscopic or cosmic entities.

of *MRC* – is one of the sources of the unrestricted applicability of this method to any process of conceptualization subjected to the constraint of excluding by construction the false absolutes.

(7) Reconsider the fact that a view *V* is by definition a union of a finite number *m* of aspect-views *Vg*, $V=\cup_g Vg$, *g=1,2...m*. Each aspect-view *Vg* introduces its own *semantic g-axis* that carries the 'values' *gk(g)*, *k=1,2,...w(g)* chosen for being considered on *g* (*w(g)* is the cardinal of the set of values chosen for being considered on *g*). So *V* introduces by construction the abstract *representation space* defined by the set of its *m* semantic *g*-axes. It follows that:

> *Any relative description* $D/G,æ_G,V/$ *consists of a cloudy finite structure, namely a finite 'points-form' of (gk)-value-points* with *g=1,2...m, k=1,2,...w(g) contained in the m-dimensional representation-space of the view V introduced by* $D/G,æ_G,V/$.

If the object-entity $æ_G$ is of *physical* nature one must add inside *V* a *4*-dimensional discreet space-time view *V(ET)* and then the relative description $D/G,æ_G,V/$ becomes a cloudy finite structure or 'form' of *(space-time-(gk)-value)-points* with *g=1,2...m, k=1,2,...w(g),* and *x,y,z,t*, some *finite* space-time grid upon which the units of space and time impose a discrete set of possible space-time values; this whole form being contained in the *(m+4)*-dimensional representation-space introduced by the view *V*[22].

(8) One can form *chains* of relativized descriptions, connected via common elements from either their respective entities-to-be-described $æ_G$ (so somehow connected via the involved operations of generation *G*), or from the structures of their views *V*. Along such a chain there exists a *descriptional hierarchy* or *order*: In general the order *1* is *conventionally* assigned to the first description from that chain; the second description connected to the first one is then of order *2 with respect* to this first description (a *meta-description*[23] with respect to the first one); the third description is assigned the order *3* and it is a meta-description with respect to the description of order *2* and a *meta-meta*-description with respect to the first description from the chain). Etc. So in general the order of a description inside a given chain is relative to the process of construction of that chain.

But consider the case of a chain of descriptions that starts with a basic, a first-stratum, a transferred description. In such a case:

> *The initial basic transferred description determines an* ***absolute***[24] *beginning of a particular process of construction of knowledge. To express this the order 0 is systematically assigned to it.*

(9) Passage from a given description from a chain of descriptions, to the following one, is commanded by *the methodological 'principle of separation' PS*:

Each relative description $D/G,æ_G,V/$ is accomplished inside an epistemic referential *(G,V)* where *G* – in consequence of the methodologically posited one-to-one relation $G\leftrightarrow æ_G$ – is tied to *one* entity-to-be-described $æ_G$ and the view *V* consists of a *given finite* set of aspect-views *Vg* each one of which carries a *finite* set of aspect-values *(gk)*. Furthermore the relative description $D/G,æ_G,V/$ is achieved via some finite number of realizations of successions *[G.Vg]*. So a relative description $D/G,æ_G,V/$ is by construction *a finite 'cell of conceptualization'* : if *all* the aspect-views from the global view *V* have been taken into account, and *each* one with *all* its values *gk*, and after the realization of some arbitrarily large but *finite* number of successions *[G.Vg]* performed for *all* the aspect-views *Vg* from *V* a descriptional invariant *has* been found, then the description $D/G,æ_G,V/$ has been achieved and thereby the descriptional resources from the epistemic referential *(G,V)* have been entirely *exhausted*. If nevertheless one wants to obtain some new knowledge connected with $æ_G$ and *V* that has not been produced inside $D/G,æ_G,V/$, one has to bring in *another* convenient epistemic referential *(G',V')*, different from *(G,V)* either via a $G'\neq G$ or via a $V'\neq V$ or by both, and to construct inside *(G',V')* the

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[22] If all these distinctions were made inside the theories of chords, the significances involved might become clearer.

[23] In logic the verbal particle 'meta' indicates an *imbedding* language, so it is conceived as placed 'under' the studied language. Here, on the contrary, 'meta' is deliberately assigned the significance of *'after'-and-connected-with*.

[24] This is not a ***false*** absolute, it is a factual datum, so *MRC* permits it (as it also permits its definitions, principles, conventions, that are absolutes inside the method).

new relative description $D/G',æ_{G'},V'/$ connected with $D/G,æ_G,V/$ but corresponding to the new descriptional aim.

These were preliminaries. Now:

> The principle of separation *PS* requires that the *new* description $D/G',æ_{G'},V'/$ be always achieved by a process *explicitly and entirely* ***separated*** *from the descriptional process that has led to* $D/G,æ_G,V/$.

Thereby any uncontrolled coalescence or confusion between the aims and the geneses concerning two distinct but connected relative descriptions is systematically avoided.

(10) Frequently, in a chain that starts with a basic transferred description of order *0*, in the immediately subsequent description of order *1*, the initial transferred description of order *0* – as a whole – is put in the role of the new entity-to-be-described, in order to be qualified by a certain peculiar sort of view that assigns it 'values' of an 'aspect' with *definite (and usually connected) space-time support*; whereby the unintelligible transferred description of order *0* becomes intelligible in the sense that it gains conformity with the space-time frame principle *(6)*. A view that generates such conformity is called an *intrinsically modelling view*. The final result of such an explanatory description of order *l* can then be *detached* from its genesis. This leaves us with a ***model*** of the basic, transferred description with order *0* from the considered chain. Still later inside the same chain it becomes possible to construct a meta-description of higher order that furthermore introduces the classical concepts of 'cause' and of 'locality' and thereby enters the domain of validity of 'determinism' in the sense of classical physics.

In this way, inside *MRC* there emerges a *split* inside the pool of all the relativized descriptions that are achieved at any given time. Namely, the very first relative descriptions from this pool – of absolute order *0*, basic, transferred – constitute *a primordial* ***stratum*** *of conceptualization*. As for the corresponding classical models of the transferred descriptions from the primordial stratum, together with the progressively more and more complex forms acquired by them, with their insertions in nets of more complex conceptual structures, they constitute an evolving classical ***'volume'*** of conceptualization of which *the thickness is growing indefinitely*.

Thereby *MRC incorporates the famous '[quantum-classic] cut'* and explains it inside a generalization in terms of a concept of a ***universal transition*** *'[(transferred descriptions)⇒(classical descriptions)]'* (we say 'transition' and no more 'cut' because inside *MRC* the connection between a basic transferred description, and the models that 'explain' it, is defined in detail).

(11) According to *MRC*:

> *Any* ***knowledge*** *that can be communicated in a non restricted way*[25]*, is* ***DESCRIPTION****.*

Only descriptions can be *unrestrictedly* communicable *knowledge*. 'Facts' that are exterior to any psyche, or psychic facts (emotions, desires, etc.) that are not expressed by some more or less explicit description, verbal or of some other constitution, are not 'descriptions', they are not unrestrictedly communicable knowledge. When we say « I know this house » we spell out an illusion, either because of unawareness or only for the sake of brevity. Only the assertion « I know some *descriptions* (restricted plural) of this house » would express rigorously the situation toward which we want to point and we can do it.

This is not a trivial distinction: It sweeps away in one big gesture the whole naïve realism. Inside MRC it leads to a ***proof*** – in the proper sense – of Kant's direct postulation of the assertion that "physical reality" cannot be "known such as it is in itself"; this postulates transmutes into the conclusion of a *deduction* that the notion of "knowing such as it is in itself" is self-contradicting, an ill-constructed notion, because knowledge of a physical entity (like any knowledge) involves qualification (like knowledge of *any* sort of entity), qualification involves a grid for qualification, and

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[25] The action of 'pointing toward' restricts to real or virtual co-presence inside some delimited space-time domain; so do also mimics, emotional sounds, etc.

the non removable and non separable relativity to that grid, of the resulting qualification of the considered real entity, distinguishes the involved physical entity, from any of its qualifications.

And, last but crucial:

(12) *When the concept of probability is re-constructed inside MRC,* ***the "events", elementary or not, acquire the conceptual status of relativized DESCRIPTIONS****.*

The *MR*C descriptional status of probabilistic "events" is *not* that of an entity-to-be-described $œ_G$. It is that of a relative description of some involved entity to-be-described $œ_G$ that *has to be radically distinguished from any one among its descriptions, whether realized or potential* (MMS [2006]). If the entity is kept the same, its descriptions can be varied freely and indefinitely via the use of convenient views. So the concept of probability tree of a given entity-to-be-described penetrates, generalized, into the *classical* thinking. This acts as a quite essential progress because it entails a considerable increase of the power of expression and discrimination and it avoids quite a lot of illusory dead-ends.

Thereby – as well as via the principle of separation – "divide et impera" can be paraphrased: "distinguish and understand".

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