

The Ontology of Knowledge, logic, arithmetic, sets theory and geometry

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Objective of the article

Nota: It is recommended to read the article «Introduction to Knowledge Ontology» (Ref : OdC) prior to this article.

The quarrel (simplistic it is true) between materialism and idealism is moot.

The OdC shows that the Facts of thought as well as the Facts of the world are Facts of Knowledge, facts of representation. The category "Idea" as well as the category "Matter" and all the facts or objects that occupy them, are above all products of conscious thought, expressed in the language of conscious thought, in the world that conscious thought has formed. Atoms exist no more or less than Ideas if not as a creation of the Spirit and therefore cannot in any way be the *a priori* cause of the Spirit.

But the facts of conscious thought cannot be "associated" to a reality other than "reality," no more to the mysteries of the psyche than to an Ideel world.

For the OK, matter and thought are one and the same essence: Meaning; different modes of order of the same substance: Interdependence and resulting from the same process: the Logos whose principle we must seek upstream of matter and thought.

This does not make the OK an anti-realism or an idealism (ref: SOLI) because according to the OK, there is a reality and our representations belong to this reality.

At ordinary scales, the ontological model proposed by Ontology of Knowledge (OK) does not call into question the representation of the world elaborated by common sense or science.

The representation of the world we use is « true » in that its effectiveness is a necessary condition for our existence, to us subjects that represent.

This is not the world such as it appears to us and as science describes it that is challenged by the OK but the way it appears to the knowing subject and science.

Mathematics will be considered here, both as vocabulary and syntax that support the rigor of scientific discourse.

In spite of the efforts made to separate scientific reasoning and metaphysical considerations, in spite of the rigorous construction of mathematics, these are not, in their very foundations, independent of modalities, of laws of representation of the world.

For example : The expression «*Natural integers*» is an oxymoron because nothing is one in nature ; unless we consider this expression as deduced from the more general proposition < *the meaning is individuated by nature* > which says that individuation (of sense) is a necessary consequence of the transcendental process of creation of meaning: the Logos.

Confront to reality the laws of the world conceived by science do not free us from the previous observation. Indeed : by the experimental proof, only the laws of the representation are proved persistent/consistent, because what science foresees and verifies with accuracy, it is not the facts of the world but the facts of the representation of the world. Beyond the laws of representation, nothing proves to us that there are laws of the world (see Ref MOND).

Remember, however, that mathematics « are worth themselves » and can not be called into question « for themselves » by an ontology. The only question is the process of creating meaning that provides mathematics with their intuitions a priori.

The first objective of this article will therefore be to identify and clarify what ruptures proposed by

the OK could affect intuitions *a priori* which found mathematics but also could explain the remarkable ability of mathematics to represent the world.

For this, three major intuitions of form will be analyzed, namely : the intuition of the One, the intuition of time and the intuition of space.

Then considering mathematics in two major classes : {logic, arithmetic, set theory ...} on the one hand and geometry on the other hand, we will ask the questions :

- How does the OK affect their premises and rules of inference ?
- In case of incompatibility, under what conditions can such a mathematical theory be made compatible with the OK?
- Can we deduce a possible extension of the theory ?

The intuition of the One

OK states that nothing is One in the nature.

But things that are One are necessary to our representation of the world.

So much so that arithmetic was born on the concept of a perfect "One".

How is it possible that we get such a strong intuition of something that is not real ?

How perfectly one is the "one" ?

If things One are representation by the subject, what is the influence of the subject ?

-The reality is formless : (Ref *OdC*) : There is no natural language to describe reality, no « true » language, no first language. In this sense, mathematics are no more no less legitimate to describe reality than any other language.

-Reality is Interdependence -Interpendence is In-act. (ref *OdC*)

Interdependence is a priori non-physical, immaterial.

The predicate « In-act » states that Interdependence is not subjected to time and space.

Since the logical relation and the geometric object possess these characteristics to be immaterial and In-Act, logic and geometry would be better suited to represent a Reality made of Interdependence than our usual languages, structured by a materialistic model.

This is only true on the condition that the meaning of terms used by logic and geometry does not implicitly reintroduce the materialistic model.

Let's highlight, for example, the difference between **Reality**, **Actuality** and **Existence** as per OK : The **Reality** is formless, without any order, without any space; nothing there exists *a priori* that could be named.

Actuality : In the interdependent Reality, infinites of infinites of orders are possible. In a Reality which is conditioned neither by time nor by any ordered space, all these orders are **Actuals**. As can be said actual all the solutions of an equation.

Existence: The OK then shows that a network of Interdependencies (a Knowledge) stemming from a Point of View necessarily has singularities. These singularities **Exist** for the point of view as much as, in this network, their probability of being travelled through is not zero. These are Facts of Knowledge.

From these definitions one can say that a logical fact has only "Existence" when its meaning appears to a subject.

One can also say that "Reality" of logical facts is a non-sense and that "Actuality" is a mere judgement on their syntactic possibility.

An illustration (with its limits) of the difference between actual and existing :

In a language, all the grammatically possible sentences are actual, so much so that no one can prove that a given sentence was never pronounced.

Sentences come to exist for a subject only from the moment when they are formed in his mind, when he pronounces them, when he hears them. They then get a place, a non-zero probability of Existing in the Knowledge of the subject. The Linguistic knowledge of the subject (his competence according to the terms of N. Chomski Ref : LDP) then «includes » a non-zero probability of these sentences.

The expectations triggered by the meaning of the sentences affect then the subject's Knowledge.

Paraphrasing Descartes one could say:

“ The proposition : I am, I exist, is necessarily true each time I pronounce or conceive in my spirit whatever proposition”

It follows that any proposition, any sentence that is present in the subject's mind states ultimately and for the subject only, his own Existence.

We will see later how important is this remark.

-Interdependence is unfounded.

-A Knowledge is unfounded, without foundation, without first element . (ref OdC)

Being non-founded, Interdependence has no need of a substance.

Interdependence is infinitely tenuous. The Existence of a primary Fact, that would be its substance is infinitely improbable, only singularities can Exist with non-zero probability, for the knowing subject.

The Fact is a singularity of structure, unfounded, without first Fact, without substance.

If Facts are unfounded, the « Interdependence link », as a relationship between Facts, is itself also unfounded, infinitely divisible, without substance.

If Facts and relationship are unfounded, any judgment of consistency or invariance, any law relating to Facts and their relationship is unfounded, without substance.

Laws are classes of Facts, meta-Facts, unfounded and without substance.

The Existence of Facts, relationships or laws, in our representations, are **predicates contingent to infinity** ..

predicate : because it is Meaning for the subject. Only the subject knows the Existence of the Fact. A subject is necessary for the Existence of the Fact.

contingent to infinity: because if the appearance of singularities i.e. of Facts is the necessary consequence of complexity, no Interdependence relationship can be shown as binding a Fact to an other Fact as a necessity. Any Interdependence relationship binds Facts in a contingent manner, infinitely. Only the complexity of the structure makes the appearance of Facts necessary. Necessity is a judgement on a infinite of contingences.

The structure of Interdependence is itself a Fact, a meta-Fact, therefore its Existence is also a predicate contingent to infinity.

The Meaning of our Knowledge describes a Reality that is incommensurable to it. The reality of the Fact of Knowledge, situated beyond the horizon of the Meaning, is without limit.

Meaning expresses through the Act, the unfounded reality of the In-Act.

The beings, the links, the laws are Facts of knowledge. Their unity is only made necessary by the effect of structure that itself is only made necessary by the effect of a meta-structure etc...

Unity is not an essence.

The “One” to which we attach a name and predicates, the “one-to-one” relation which links a One with another One are not things, they have no substance, they are as virtual as the rotation axis of a vortex. And still they are structurally “One”

-Except for a consciousness, there is no object (Ref: MOND)

From that proposition follows that the physical world does not exist without subject, i.e. in any

Existence there is a subject, including in the Existence of the solar system a billion years ago. It is delusion to believe that the subject can be excluded from models that science, including mathematics proposes to us. The expression $\langle 1+1=2 \rangle$ implies and therefore states the Existence of the subject.

Any equivalence (in the mathematical sense) between Reality and our representations, any one-to-one matching between Facts of Knowledge (reality) and logical facts (our representation) is doubly affected : on one hand by the non-foundation of the Fact of Knowledge and on the other hand by the inevitable presence of the knowing subject in the representation (Ref : MOND app. V) .

Only Exist Meta-Facts of Knowledge.

Equivalence is a meta-judgment, itself unfounded, therefore unprovable.

This affects not only the unity of the thing but also its existence as universal truth.

A Fact of Knowledge Exists if it appears to the Knowledge of a subject.

The Fact of Knowledge only Exists for and by the subject.

To designate Facts of Knowledge as Existing it's integrating them into the class of «Existing-for-the-subject».

The Facts that appear Existing and disjoint to the subject, on the horizon of his representation, have between them, in the depth of their In-act, the necessary Interdependence to appear in the class of «Existing-for-the-subject».

Facts «Existing-for-the-subject» are never really disjointed. The apparent disjunction between the Facts comes from that the consciousness observing the Fact, neglects the conditions of observation, as shown in appendix II.

The absence separating, in representation, the Facts «Existing-for-the-subject» is also a Fact of representation, a structure of interdependence.

The knowing subject shall not ignore this structure of Interdependence because it is the In-act of his perspective and it is according to this perspective that he can make judgement on what Exists or not.
Ref WMdP

The intuition of time

OK states that Reality is not subjected to time.

And yet OK shows that a thought/subject can only Exist as object for a wider thought/subject that comprehend it. And so on (almost) indefinitely.

This is the Anima: the principle of a necessary subjective time.

This time of the subject, i.e. of the representation by the subject of the world and himself, does it really apply to the Reality of the world and of the thought/object, ?

How is it possible that we get such a strong intuition of a time of the world ?

An analysis of the intuition of time may appear off-topic in a discourse on logic and geometry. Let's say that the aspect «time» is the flaw with which appears to us most obviously, the epistemological error committed by common sense and science, which is to enclose the In-act Reality *a priori* in space-time, while space-time is Meaning and Meaning is not *a priori*.

Sense is a part of Reality and Reality is in an immeasurable ratio to Sense. Reality can not represent all its complexity by the Sense which is only a part of it. Complexity (and not only extent) must be cut by Meaning.

Restpoints are required for any representation, cutoff surfaces definable in representation spaces with finite dimension, carrying a Meaning with finite complexity.

These cuts, which delimit the fact and which the OK names Acts, are crossed by a « orthogonal » Transaction * which acts both the interdependence of the Fact with its neighborhood and the dynamics of its logical expansion.

The article « Philosophy of language and OK » (ref PLOC) shows that the cut carries the Meaning

of a present moment of the Fact of Knowledge which Becoming is carried by a Transaction*

**The term « transaction » is used here in reference to the concept of « transduction » used by G. Simondon in many of his writings (ref ILFI, IPC). The concepts are indeed very close and associated with concepts of individuation that are themselves close. The transduction is precisely defined by G. Simondon and the concept enjoys a large publicity. I preferred to use another term, on the one hand because the confusion of the concepts would harm a good understanding of the OK and on the other hand because the radical « act » in « transaction » seems to me to be better suited to what goes through the Act. Moreover, the OK shows that the Meaning is revealed by the appearance of quantified Facts. The term « quantum of action » is then perfectly suited to the description of these facts in the context of physics.*

The whole of these cuts bearing the Sense forms the horizon of the Knowledge.

At the most naive level of description of conscious thought, it is already evident that all the physical facts that constitute the representation of the « present of the world » can not be contained “in reality” simultaneously, in the present of the world. Since Einstein, we can say that the simultaneity of these physical facts is a meaningless concept.

The « physicalistic » temptation is then great to locate these facts in a « past of the world » so as to give a little time to the process of representation to unify them, but not so much so that the concept of present time keeps its meaning.

If it is obvious that such a reasoning answers in no way the question of the unity of consciousness at the present moment, it is equally obvious that this reasoning is circular since the « past of the world » is what consciousness represents as its past.

It is inconsistent to constrain the time of thought/object * to reside in the timeframe conceived by the thought/subject.

* Warning: The thought/object is not the brain matter, even extended to the eyes, ears, skin or even to the whole body. We cannot define an *a priori* limit between the thought and the world. The thought/object is all the bundle of In-act interdependence, the “activity” as Schopenhauer called it, to which I am interdependent.

The thought In-act or thought/object is neither in the present of consciousness nor in its past.

The In-act of the Knowledge of the world, what is real beyond the horizon of the Meaning, is not in the time of the representation of the world.

The In-act of the Knowledge, what is real beyond the horizon of the Meaning, is not in the time of the represented world.

The In-Act of conscience is not in the conscious time.

What is com-prehended is not in the time of what com-prehends.

The same demonstration, detailed in (Ref OdC), is applicable to Facts of Knowledge. The cut, the Act that delimits the Fact carries a present moment of the Fact and a « orthogonal * » Transaction vector, but the In-act of it, its reality, is neither in the present moment of the Act, neither in a supposed present time of the Fact.

*The term « orthogonal » used here only qualifies as a first approximation the relation of Sense to Becoming. If it is true that Meaning appears to belong to a present moment of the Fact, it is indeed the revelation of the Sense that shall be identified in essence to the Act of Becoming, according to the principle of Anima (ref OdC and PLOC).

The relevance of the qualifier « orthogonal » is largely due to the incommensurable ratio between Reality and meaning, between the In-Act of the Fact (its Reality) and the Act by which its meaning is revealed. What is revealed as a Fact hides a « reality » without limits. As if a reality of infinite dimension was projected into a three-spatial-dimensions present moment of our representation.

Through the intuition of time according to OK we can see the watermark of the Newtonian and

relativist intuitions. The former considers a strict orthogonality of space (the present of the Universe) compared to the time, the latter considers a variable « angle » between space and time, defined by a tensor.

The intuition of space.

Before going into the heart of the matter, a detour through appendix I will show to the patient reader how conflict can arise between the intuition of space and the logical rigor of recurring reasoning, though both of which are equally essential to our reason.

Existence and position of the object are not two different phenomena.

The mind locates the object by the same Act as it makes it Exist.

There is no place of space where the object would be, no geometry in the real. (Ref MOND)

A geometry that locates objects in space is already a very high degree of conceptualization by thought. This geometry has no counterpart in reality.

There is no point, no line, angle, surface etc. in reality.

Just as it is inconsistent to represent the time of the thought/object in the time of the thought/subject, it would be inconsistent to affect to thought/object forms and places described through the concepts of form and place elaborated by the thought/subject.

The In-Act of the Fact of Knowledge is not in a place describable by meaning. Can we say that the « In-act » of a pressure is in the place of the manometer ?

The Unity of the Fact-of-Knowledge is structural and logic. The common location of the Fact does not result from a spatial community of its attributes. What unites the attributes of a Fact is

Meaning : the association of attributes into a common law of probabilities, a common expectation.

These common probabilities define, among others, the spatial Sense of the Fact, as it appears to the subject.

Appendix III shows, based on the ideas of Maine de Biran, that the Fact-of-sensation emerges off the faculty of feeling, and not from a fact in vis-à-vis. It is only after having affected the mind in depth, in a diffuse form, that the sensible phenomenon appears as a Fact-of-sensation. In other words, the ability to combine Facts of sensations into Facts of knowledge does not stand at the level of the reason of the subject but at the level of the thought/object.

Knowledge operates by detachment and not by synthesis.

It is the faculty of knowing that lets the Fact-of-sensation emerge out of a whole, organized as a global perspective in the thought/object.

The intuition of space is not an *a priori* condition of any experience.

Spatial sensation is born from the global faculty of representing. It is consubstantial to meaning.

It is determined by knowledge and its laws and not by an external cause.

Let's recall the OK axiom : « Reality is formless »

If there is no spatial sensation *a priori*, there is not either spatial order *a priori*: things are neither « closer » nor « further » in reality but only as a representation by the subject and according to a perspective that is not limited to space aspects.

The laws of Logos are *a priori*. They are even a necessary condition to the existence of the subject.

These laws are binding, among other, on the emergence of the formal concepts and sensations of space and time, that are Facts of Knowledge.

The formal sensations of space and time result from the laws of Logos.

Laws of Logos are universal. Though statistical, the laws of Logos are extremely consistent since they involve gigantic amounts of Interdependence.

Nevertheless, from these laws it results for the Point of view, i.e. the knowing-subject, individuated and non-universal (relative) instances of representation of a world in space and time.

Logos' eigen-solutions are the forms of the world:

The following lines resume and develop the article « introduction to OK» (Ref OdC).

They enumerate different eigen solutions of the Logos associated with different intuitions of form of our world.

- In absolute, if a part of Reality is completely closed on itself, there is no need for cut. Being cut off from Reality, this part does only exist for itself.

Approaching this absolute solution, our geometrical intuition of the world, proposes us the concept of event with (numerable) causes and consequences.

- Then comes the zero expansion solution, which could be symbolized by $A \leftrightarrow A \leftrightarrow A \leftrightarrow A \leftrightarrow A \dots$ in which A is self-determining, indefinitely. The cut that would isolate such a chain would be dimensionless (2 points) which defines, in our geometry, a one-dimensional space. We recognize here the intuition of a material point A becoming itself.

As we saw in the paragraph on the intuition of the One, since reality of A is unfounded, the relation $A \leftrightarrow A \leftrightarrow A$ is not a simple reflexivity, a simple relation from the same to the same. The unity of A and its persistence, as they appear to us, come under the principle of individuation.

- Then comes the solution with an expansion rate that is non-zero but low enough for cuts with finite dimension: 1,2,3 etc.. to be possible in the Knowledge.

- The case where the cut is a 2-dimensional continuum corresponds to our intuition of the wave: an expanding surface. A Fact of Knowledge whose Sense is carried by a two-dimensional cut, and which is animated by a Transaction, a one-dimensional « orthogonal » Becoming in every point of this cut.

- The case where the cut is a 3-dimensional continuum corresponds to the intuition of space and time. The three-dimensional cut is a « present of the spatial representation». At each point of this 3D cut, the configuration of Transactions defines a one-dimensional becoming (time) vector.

Impact on logical theories (logic, arithmetic, set theory)

The meaning and therefore the Existence of the Fact of Knowledge, of the relation between Facts, of the law that generalize relations between Facts are **predicate infinitely contingent**.

It means that although unity of the Fact and its meaning have necessary reasons to appear to the subject, they are not provable because it would take a complex and unfounded set of logical inferences to establish that proof. Just as the roulette player can say «I am broke» as a fact when he enters a casino with the intention of playing there infinitely.

This is neither a deficiency nor a limit inherent to our human condition but an essential truth: reality is indelible simply because it is unfounded, complex and “logically prior” to the Meaning. Fact of Knowledge, its Unity and its Meaning are not real as per common sense but they rightfully Exist for the subject.

Meaning is therefore not a mere “name”, it is not the “name of nothing” it is not a name “invented from scratch”. But the Meaning is not the name of “something” that has form in reality and it's no more build-up from atoms of Meaning.

Meaning is “creation of form” and form is not “an other thing” than the Fact of what it is the form. Form is what appears extensionally from an intensional reality.

Let's take the words of A. Badiou:

The name is what can be said extensionally of the unrepresentable (OK's note: the intensional reality of the fact), form that presents itself in the frame of multiplicity shall not be considered as “an other thing” than the unrepresentable [Ref : Badiou p.80.]

Note the double meaning of “*an other thing*”: not only the meaning is not else than what it gives meaning to, but also it is not “a thing”.

Having stated that there are no things in reality, it would be inconsistent for OK to designate the Meaning as “a thing”

Meaning of Facts is not a thing. At best could we say that a predicate is a meta-Fact, the complexity of which is lesser than the complexity of the Fact it qualifies.

Color for example is a meta-Fact, a class of Facts that is less complex, as a class, than the Fact it qualifies.

Conditions and modes of Existence of Meaning are, for the subject, the same as those of the Fact. Predicate is a singularity, a set of interdependent Facts, a class of Facts the Unity of which appears to the subject.

One could say for example that in the multiplicity of the subject, the Meaning of the “Socrates” Fact is interdependent of the meaning of the “ugliness” Fact.

The “Socrates” Fact reveals its Meaning through a Transaction that carries the possibility, according to a given probability, of the appearance of the “ugliness” Fact.

This possibility is not “presented” to understanding, nor even “deduced by the understanding”. It is in itself a logical Fact constituent of the representation. Understanding is itself only a meta-category of representation.

Under these conditions how it is possible to state a formal equivalence between a Fact of Knowledge and its meaning i.e. the Fact of logic, the proposition that is used as its label?

Any Fact of logic, any proposition associated to a Fact of Knowledge is a judgement: the replacement, necessarily approximative, of a complex and unfounded reality by a set of relations extensionally expressible within the multiplicity of the subject.

Back to Socrates: the representation of Socrates ugliness by the subject expresses (in a way) the probabilistic relation:

$\Pr(\text{Ugly}|\text{Socrates}) \approx 1$ knowing that $\Pr(\ll I \gg|\text{Socrates}) \neq 0$ et $\Pr(\ll I \gg|\text{Ugly}) \neq 0$
Socrates is ugly *Socrates Exists to me* *ugliness Exists to me*

Since the Meaning is not else than the Fact, what we call **equivalence** and will ground the concept of isomorphism shall be replaced by **idoneous form**.

The concept of **isomorphism** shall be replaced by the concept of **morphogenesis**.

Morphogenesis, attribution de form, is idoneous as soon as the extensional relationships it introduces into the multiplicity of the subject do not jeopardize his Existence, i.e. the continuity of his Individuation. We see here themes developed by E. Kant (Ref: CRP)

Proposition A is therefore not logically certain, as soon as it is claimed that A designates a Fact of Knowledge.

It follows that the relation $A = A$ is not provable. Its reflexivity is not provable

The same will be true of any logical relation between logical facts.

So the relation $A \rightarrow B$ does not have a precise truth.

In a recurrence, the first judgment of equivalence which states A, the uniqueness of « successor », its recurring otherness ... are uncertain truths.

This questions the very possibility of a recursive reasoning and therefore the possibility to logically build a infinity of Facts.

Should we then imagine «natural » logical theories without recursivity ?

Are such theories only possible ?

Could a non-recursive arithmetic be an analytical basis for non-Euclidean geometries ?

Further on :

The Existence of the Fact is not universal but relative to the subject.

The Fact of Knowledge only Exists for and by the subject.

The truth of propositions «there exists A» or « for all A» is relative to the subject.

If the predicate of Existence of A is relative to the subject, so is its belonging to a set according to a law, because the law itself is a class of Facts, that is to say a meta-Fact, which has Existence only relatively to the subject.

In appendix V we show, from Whitehead's ideas, that the world of the subject is not the juxtaposition of disjoint Facts with absolute Existence.

The Existence of a Fact contributes to assert the existence of the subject (see appendix II).

That participation to the subject's Existence is its only mode of Existence.

For the representation by the subject, the Existing is therefore distributed according to a law of probabilities of Existence whose sum can not exceed the certainty of his own Existence.

The Universe is my representation, it is all of the Existing. The universe can therefore not Exist to me more than I exist. I am necessarily the All of the Existing.

This principle can be expressed very concretely: For the subject to be able to make A and B Exist in the same representation, the In-act of A and that of B can not be totally disjointed, the Senses of A and B, expressed in terms of the probability of "I" do not add up then exactly.

The "I" subsumes necessarily the totality of what makes sense (ref : MOND).

Reminder : « *The world is my representation, my representation is the world* » (Ref : QRPR) .

There is not on one side the proposition $\langle A \rangle$, that could be qualified of propositionnal Act and on the other side the Fact \langle designated by the proposition A \rangle .

It follows that logical propositions that state the meaning are also subject to this subsumption by the "I" of the subject.

Mathematician can therefore not absolve himself of this constraint on the grounds that mathematical facts are pure facts, ideel, detached from any contingency other than the formal rules has *a priori* set: " *if y declare $A=A$ as an axiom, it shall be true inside my theory !*"

This is delusion, the false belief that axioms edited by the thought/subject have authority on the thought/object. The extensionnal thought has not the power to abstract itself from the intensional thought, from its intensional reality (unspeakable and unfounded).

Extensional thought is a meta-Fact.

There are no multiplicities, no mathematical varieties without subject, no more than there are objects.

If the subject can influence (consciously or not) the path that his representation of the world follows, he has not the power to abstract himself of this represented world. What he represents is himself and he is what he represents. His own Existence is the condition of appearance of any Fact of his knowledge, including (and probably in the very first place) mathematical Facts.

Note: Existence being so defined, mathematical Facts Exist in the same way as Facts of the world.

Note also that putting in common, sharing and comparing the mathematical Facts and reasoning do not change the fact that the subject is in there.

OdC is not a solipsism. (Ref: SOLI)

An arithmetic of numbers Existing-for-the-subject should respect this constraint: namely that the integral sum of the Existences of the numbers, extended to the totality of the field of this arithmetic, is limited to 1.

Should we imagine logic, arithmetic non-universal, relativistic, limited by a horizon * focused on the subject, bounded by the certainty of existence of the subject ?

* Note that this question relates to the possibility or not of building by recurrence an infinite of Existing. The question of an actual infinity is non-sense for infinity is a form and Reality has no form. Actual infinity is beyond the horizon of meaning.

The rejection of a truth in reference, the new definition of Meaning allow logicians to merge intentionality (the United meaning of propositions) and extensionality (their logical interdependence) into a concept of Transaction by which the In-act of the proposition (of the fact of logic) takes meaning (reveals its intensionality) in the form of a law of probability on the eigen-solutions of its extension towards its logical neighborhood.

From the notion of Transaction emerge two new notions (already mentioned in the ref OdC):

- that of **Power** (or of importance to use Whitehead's term), notion of quantity, of « more or less », the relative contribution of proposition A to the Existence of the subject, the probability of « I » knowing A: $(P(\langle I \rangle | A))$. The term 'power' comes from that the meaning of A is only expressed by its contribution to the Existence of the subject and this Existence is only expressed by his individuated becoming.

- that of **Will** which qualifies the way in which the In-act, by its structure of probability, directs the expansion of the Fact towards its neighborhood. What will happen next ? Which direction will take the expansion of the theory ? Which of the possible “me” will happen ?

We can now state that : In a logic of Facts Existing-for-the-subject, the integral sum of the Powers of the Facts, extended to the totality of the field of this logic, is limited to 1.

As shown by OK for the representation of the world, a logical series in which a term may have more than one successor would necessarily lead to complexity and complexity leads to the appearance of individuated singularities that could have to each other, asymptotically, ordained relations similar to those of classical arithmetic.

Could arithmetic result from the separation of complex rather than of the composition of simple ?

Could « classical » arithmetic be considered as a limit, asymptotic case of separation and ordaining ?

Impact on geometry

The article "The OdC and the form of the World" (ref: MOND) illustrates how reality appears to the subject in the form of objects in the becoming, in a four-dimensional space (variety) whose time of the subject (its becoming) would be a privileged dimension

It details the birth of Poincaré's theses about geometric space: namely, that it is a convention created by the understanding.

The OdC adds that geometric space is not an isomorphism of reality but a morphogenesis, that geometric shapes and their relationships are idoneous in the sense that they are consistent with the individuation of the subject.

The idoneity of the forms created by the Logos is neither providential nor contingent but essential, since representation by the subject is a eigen-solution of the Logos, a transcendent principle.

We see in it that geometry is necessarily relative to the subject and that the properties of its objects emerge from the global process of representation.

The discussion of appendix V shows that in a geometry of points Existing-for-the-subject, the integral sum of the powers of the Facts (points and their relations, i.e. figures), extended to the whole field of this geometry, must be limited to 1, i.e. to the certainty of the Existence of the subject.

In that sense, geometry is not distinguished from arithmetic.

Would non-Euclidean geometries be based on "non-Euclidean" arithmetic, itself resulting from the logical properties of the Logos ?

The question of empty space remains open; not on the nature of empty space which is a Fact of representation, but on the logical process that leads to representing a void between objects and events.

We can nevertheless say that:

- On the one hand, the mind knows how to create the void where there is certainly not: whether it is subjected to a virtual image 2 or 3D or to a virtual stereophonic sound, the spirit has no difficulty in inventing emptiness where there has never been, on the basis of pure conventions.
- On the other hand, since there is no being per se, there is no non-being per se which separates beings. There is no emptiness per se, no empty space.

Is the emptiness the logically necessary consequence of the replacement of an unspeakable (complex) reality by a dicible (not-complex) representation, of a space with infinite dimension by a space of finite dimension, from the three-dimensional cut on which one represents the present moment of our universe to the dimensionless cut on which the « I » and any Individuation is represented as a becoming?

Does emptiness come from that: a representation resulting from separation and aggregation of the complex towards an asymptote made up of monodimensional becomings cannot be infinitely dense ?

Does the passage from the complex to the dicible require emptiness, by simple logic?

Can the Individuation as "bodies" in becoming be the only form representable by our minds, the only quantum of Meaning that can Exist. The "wave" and "space" forms, would they be only a perspective, a global ordaining of these quanta, requiring non-Existing ?

Is emptiness the logical answer to the paradox of the Cogito: The certainty of the "I" can not state by itself all the certainties it contains?

To paraphrase Gödel: Is there in my Knowledge actual truths that can not Exist, which remain necessarily non-Existing ?

In the paragraph on the intuition of the One, we have shown that what seems to separate the Facts

Existing-for-the-subject and which unites them is a Fact of representation. This logical void is not spatial: there is no empty space between the elements of a set.

In appendix V we can see that what surrounds the Facts Existing-for-the-subject includes the conditions of the perspective according to which the subject will judge Existence.

Philosophy of mathematics

- To the unresolved double question: "Are there any mathematical facts and, if so, are they independent of Human? The OK provides the following answer:

Infinites of infinites of infinites of infinites of logical facts are actual in Reality but do not Exist a priori.

Logical Facts (mathematical facts are logical facts) come to Exist in the representation of any knowing subject. The mathematical Facts therefore Exist in the very fact that they are represented. Representation is not the exclusivity of Human.

Human, knowing subject, is his Knowledge.

The world is the Knowledge of the subject.

The subject knows himself and knows the world. He Exists for himself and the world Exist for him as Facts of Knowledge, logical Facts.

The laws (physical and mathematical), the demonstrations, are Facts of knowledge.

- To the question why mathematics are so well adapted to describe the real, the OK provides the following answer:

The forms of the world, which come to Exist in our representations, are combinations of the Logos' eigen-solutions, they are meta-Facts of Knowledge.

The formal concepts (logical, arithmetic, geometric ...) are classes of forms, classes of solutions of the Logos, they are also meta-Facts of Knowledge.

The formal concepts that Exist in our knowledge are the seeds from which our perspective of the world is structured and ordained. A form, as it appears in our representation, is a meta-fact, the judgment of belonging to a class of facts, the laws of probability that this membership implies and ultimately its meaning.

Formal concepts are like words: words structure thought and thought makes words exist.

Beyond the structural property of unity of the attractor, of which we postulated contingency (Ref: OdC), how could we identify other structural properties of attractors and how could we trace the interdependence between their intensional and extensional properties ?

For example, how to define a symmetry of structure and how to associate this symmetry with the laws of probability on the modes of expansion that it makes possible (construction by synthesis), or vice versa on possible cuts of the structure (construction by separation).

This question is also that of the genesis of a differentiated meaning in an unspeakable and unfounded reality.

- The identity of nature, the co-Existence between the mathematical facts and the Facts of Knowledge raises another question: Does the principle of the Logos come before the Facts, does it transcend all reality, does it transcend its object? The answer to this question is already in the article "introduction to the OK" (Ref OdC):

In an unfounded reality there is no difference in nature between the law, the principle and its object. Only the knowing subject needs to make this this difference.

- As for Einstein's question: "Why is nature intelligible to us?"

The answer seems obvious: "Because all things of nature Exist by our representation"

Conclusion :

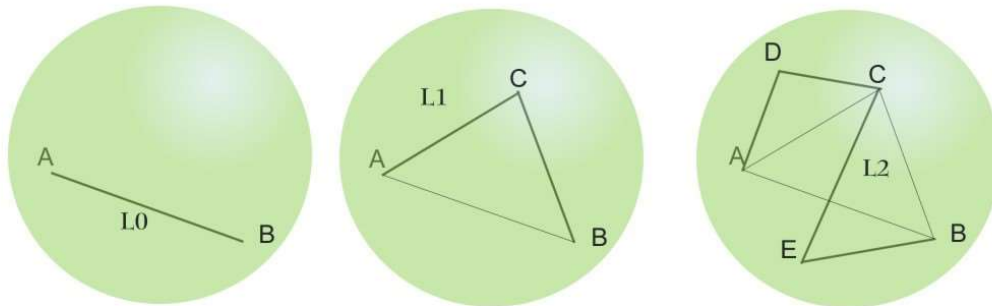
- Because the One is not founded there is no provable equivalence, no provable recurrence, no provable infinity to be built.
- Space, time and Facts appear by the same Act of Knowledge
- Because the representation of the world is the subject, no representation of the world can exceed the subject's Existence
- It is delusion to believe that mathematics and science can escape anthropocentrism.

appendix I
The paradox of the sphere

Modest exercise of geometric thinking :

Let assume the usual geometric space, with its 3 dimensions and its notion of distance $d(AB)$ between two points A and B.

Suppose in this space a hollow sphere of diameter $D = 1$.



Suppose now two points A and B on the surface of this sphere. We will call L_0 the path from A to B.

$$L_0 = d(AB) \leq D$$

Choose $d(AB) = 0.9$

One proves (demonstration without interest) that, whatever A and B, there is always at least one point C, taken from the surface of the sphere, such that:

$$d(AC) + d(CB) > d(AB) \cdot k_1 \text{ provided that } k_1 < \sqrt{2}$$

Choose $k_1 = 1.4$

We can therefore replace the initial course L_0 by a path $L_1 = ACB$ whose length $L_1 = d(AC) + d(CB) > L_0 \cdot k_1$.

We will call this operation the "separation" of AB

Since C is on the surface of the sphere, it is possible to subject the same separation to the AC segments (we add a point D on the sphere) and CB (we add a point E on the sphere) and thus replace L_1 by a path $L_2 = A, D, C, E, B$ whose length $L_2 > k_1 \cdot L_1 > k_1^2 \cdot L_0$

Repeating n times the operation one can thus create a sequence of courses L_n of length

$$L_n > k_1^n \cdot L_0; \text{ in our case } L_n > 1.4^n \cdot 0.9$$

Since $1.4 > 1$, the length of the path L_n tends to infinity when n tends to infinity.

First surprise: There exists between A and B, distant from 0.9, a course of potentially infinite length which remains confined within the sphere of diameter 1. Since at each separation, one can choose between several additional points, the number of the possible paths growth "dizzily" with n. There is therefore between A and B, a "dizzying" infinity of potentially infinite length paths, confined within the sphere of diameter 1.

But that's not all !

Suppose now that after each separation

$$L_n \rightarrow L_{n+1}$$

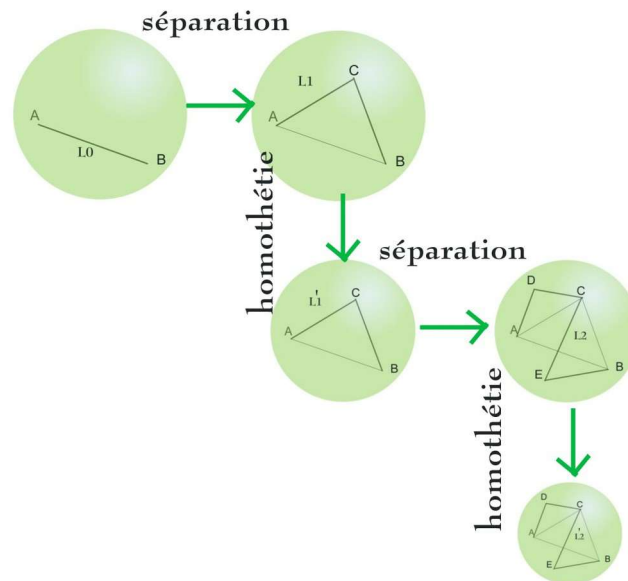
we apply a homothety

$$L_{n+1} \rightarrow L'_{n+1}$$

having for fixed point the center of the sphere and for ratio $1/k_2$ with the condition $1 < k_2 < k_1$

Let us choose $k_2 = 1,2$

During a homothety, all the lengths: the diameter of the sphere, the distance $d(AB)$ of the original segment and the length of all the paths are reduced in the same proportion of $1/k_2$



So if $L_1 > L_0 \cdot k_1$ (separation)

$$L'_1 = L_1 / k_2 > L_0 \cdot k_1 / k_2 \text{ (homothety)}$$

$$L_2 > L'_1 \cdot k_1 > L_0 \cdot k_1^2 / k_2 \text{ (separation)}$$

$$L'_2 = L_2 / k_2 > L_0 \cdot (k_1 / k_2)^2 \text{ (homothety)}$$

we therefore have $L'_n > L_0 \cdot (k_1 / k_2)^n$

since $k_1 > k_2$, $k_1 / k_2 > 1$ and therefore $(k_1 / k_2)^n$ tends to infinity when n tends to infinity

since $k_2 > 1$, $1 / k_2 < 1$ and therefore $(1 / k_2)^n$ tends to zero when n tends to infinity.

Numerical application:

With $D = 1\text{m}$, $k_1 = 1.4$ and $k_2 = 1.2$

At the 440th iteration, $d(AB)$ would be reduced to $0.9 (1/1.2)^{440} = 1.3 \cdot 10^{-35}\text{m}$, dimension slightly less than the length of Planck.

The length L_{440} will be greater than $0.9 \cdot (1.4/1.2)^{440} = 2.57 \times 10^{29}\text{m}$, which is about 1000 times larger than the supposed size of the universe.

Thus, in a purely geometric space, it is possible to create an infinity of paths of length greater than the size of the universe, all confined in a sphere of diameter less than the length of Planck, without any of these paths ever do intersect.

One would be tempted to put this calculation on the shelf of mathematical curiosities and forget it soon, as the results exceed the understanding.

This exercise does not prove anything. It does not really present a paradox, but it shows how the intuition of space and the logical rigor of recurring reasoning can come into conflict, which both are binding on our reason with the same force.

Although this exercise remains within the frame of mathematical theory, we can not avoid questioning its ontological implications.

Einstein refers to the coincidence ($dx = 0$, $dt = 0$) as an invariant, but what happens to a path such as

L'440 observed in two referentials with a relative velocity close to c ?

If the suture between Reality and its representation must be only the experience or the phenomenon.

If we only have the experiments/phenomena A and B to ensure this suture. If A and B are so closely related that no experience can distinguish them (the Planck length is the lower limit of observability). We see that between these two points the possibilities of divergence between a representative model (geometrical) and Reality are extraordinary.

The meaning of a logical proposition is to assert the Existence of the Point of view

Abstract:

The proposition "this is true" appears to us as applying to the real, to the extent that it would be a consequence of immediate sensations.

It makes sense, in fact, only insofar as it is necessary and sufficient to the Existence of the Point of View as a Knowledge.

Development:

In the expression "Snow is white", although "snow" is grammatically the subject of the verb to be, it is logically the object of the proposition. The subject of the proposition is, traditionally, what observes and declares.

This ambiguity reveals much more than a simple grammatical problem because, when one thinks about it, the real subject of the proposition is the proposition itself, in its reality which comprehends and by which converge all the conditions that are necessary and finally sufficient for it to exist; all that is proved true by the proposition itself and yet is not expressed, the "I am" that expresses the proposition and which nevertheless does not Exist, does not appear in its meaning.

This is a necessary constitutive property of our representation of the world that could be stated:

"The sense ignores the substance of Knowledge to name only the affections, the singularities, the cuts"

The conjecture of the observed object ignores the certain reality of the observing subject.

The conjecture of the seen object ignores the view as an organ and more generally all the conditions of possibility of the vision, starting with those which placed the object in the field of vision of the subject and gave to the subject the sight, speech and language.

The individuation of the "What-I-see" ignores the diffuse generality of the "How-I-see"

The common nature of all the aperceptions is yet an essential character of the representation, a prerequisite to the intelligibility of our perceptions.

This is indeed a necessary condition for the combination of stimuli. How, for example, could I form a binocular vision if the stimuli coming from each of my eyes were not brought to the same semantic denominator? How to combine sight and hearing, how to combine sensation with previous images etc...

This common semantic nature is the Fact-of-Knowledge, as a logical structure stripped of any substance. The basic principle of this structure is the loop of logical relations, the co-founded set of interdependencies.

Thus, our sensations are Facts, that is to say, logical entities, irreversibly constituted in what could be called our thought/object.

This course can not be travelled back, any meta-proposition on the existence of perceived forms is meaningless. As Bossuet wrote, "the object of the concept is never the existence of what the term means... Whether the object exists or not, we understand nevertheless the concept".

When the scholastics affirmed "knowledge does not come out of being because there is nothing outside of it", they simply confused the object and the subject of knowledge, the perceived being and the perceiving one.

The subject is Knowledge and Knowledge is the subject.

The proposition "this is true" is a part of the representation of reality.

This representation is "myself" as a present Point of view.

Our thought is a "Point of view", about us and the real.

"Fact-of-Knowledge" does not describe a cultural or mathematical concept such as set theory, nor a psychic phenomenon such as an opinion. It describes a structure of actual logical relationships, and this by not appealing to any physical or psychological reality.

"I am" is not a simple postulate but the asymptotic sense of a Fact of knowledge, of a co-founded, interdependent whole.

To play with words one could say that "I" is the "eye" of the vortex

NB: In a co-founded, interdependent set, any part is necessary to any other part and to the whole. Every part implies In-act the probability of any other part and the whole. The parts are separated only by cuts. A cut is not a disjunction, not a void, but a set representable in a finite dimensional space.

By separating the "I am", like zooming in the In-act logical links, emerges from "I am" a more complex set of Facts: the "I who thinks" from which emerges in turn the "Representation of the present reality" from which emerge in turn the "sensations".

The sensation is co-founded in the "Point of view". The co-founded structure of a Knowledge makes sensation a constitutive premise of the construction, by aggregation, of the Point of View, of the "I am".

Conversely, the sensation emerges from the "I am" by cuts without ever being disjointed. The sensation and the sign which names it imply the actual probability of the Existence of the subject, as he represents himself, here and now.

A sensation that would not imply the actual probability of the Point of View would not be represented, it would have no meaning, it would not Exist in the Point of View.

NB: We see here a possible description of emptiness as "that which does not imply (or not enough) the actual probability of the Point of view" and is therefore not represented.

The proposition "the being is this" only makes sense if it involves the "I am".

It is the instantiated assertion of the "I am"

This conclusion, written with the thinking being as the subject, is quite general: An attribute of the real, whatever the Point of view, makes sense only as a necessary and sufficient condition to this Point of view, only as a premise to the complete and coherent theory that is the Point of View.

The premise of a theory is not a condition, it is consubstantial to the theory.

Well beyond a principle of relativity, these lines state the co-foundation of the Point of View and the represented Reality, the subject and the object.

The real in the form in which it appears to us, the object of science, is co-founded in the observer's Point of view, they are part of each other. They are indisjoint.

Every experience of the real is in advance co-founded with the observer and the result will be as well co-founded.

Among the predicates, that of position is no exception. The proposition "this is in this place" expresses as well as "this is" the co-foundation of the Fact to my "representation of the real" and to the "I who thinks" and therefore to the "I am".

The position predicate is just as essential to the object as to my representation of the world, as to my Existence. Inseparably.

The predicate of position emerges by cuts in Knowledge, that is to say in the reality of the subject.

The position of the object is not a predicate attached to the object, it is necessary to the existence of the world and to my existence as subject.

The position of the object is consubstantial with the object and the subject.

- If one could disjoin the subject-proposition 'this is in this place' from the predicate it states <this is in this place> ; the conditions for the Existence of the subject-proposition would be infinitely wider, more complex and persistent than any condition to the truth of the position predicate.

- Since there is co-foundation between the sensation and the subject, the position predicate can not be separated from the subject by disjunction but only by cut. They are indisjoint.

- It would be foolish to believe that the sensation of position, in the form of an individuated sensible phenomenon, then of an individuated intelligible phenomenon, then of an individuated immediate concept ... would eventually be associated with other sensations and stated, by a subject-proposition which, for its part would have accumulated all the necessary conditions for its own existence.

No, the position predicate, like the others, emerges from the subject, at the ever-present moment when the subject and the world come to Exist for the subject.

A more general conclusion:

Every representation " is worth itself " .

Every representation, ruled by the laws of the Logos, includes its conditions of truth.

The question of the truth or of the equivalence between the object and its representation is without interest since the Reality has no form and therefore the objects are only representation.

A knowledge creates its own meaning. It gives itself Meaning.

A Knowledge comprehends its own condition, its own probability of Existence.

It follows that all science "is worth itself".

For all that, a representation (and science) is not a calm sea because the revelation of meaning implies incessant steps towards an unknown neighborhood, not yet revealed.

The relation of reality to Knowledge is unknowable.

The expansion of Knowledge towards its unknown neighborhood is made of jumps, of quantified emergent truths, hitherto improbable and which therefore did not yet exist, of breaks and changes of course.

appendix III
From Maine de Biran to the geometry of Poincaré

Abstract:

The Fact of sensation is detached from the faculty of feeling and not from a fact opposite.

Developpment:

Common sense is that the sensation comes from a fact opposite and enters the mind in the form of a sensible phenomenon, transformed by the understanding into an intelligible phenomenon recognized by reason as a fact-of-sensation. The fact-of-sensation, once revealed to reason, is combined with others to ultimately synthesize a representation of the world.

For Maine de Biran (Ref NoK and DAI), this vision is erroneous, it is to apply to the thought/object the modes of reasoning which describe material or logical systems elaborated by the consciousness (the thought/subject) and whose relevance is not established to describe the thought/object.

It is only after having generally affected the mind, in a diffuse form, that the sensible phenomenon emerges as a fact-of-sensation.

The sensation is present (although informal), as an affection of the thought/object and it is the global faculty of knowing which gives it form.

But the combination of sensation with other sensations and concepts does not happen at the level of the revealed sensation, it affects, still informal or at least diffuse, the thought/object.

Reflex acts demonstrate this.

Sensations do not combine as revealed sensations, but spread as informal affection in thought/object from which they emerge and combine.

Only then formal concepts can reveal themselves in the form of Facts of Conscience.

Sensations are not combined by reason as logical propositions would be, but sensations merge in their diffuse form as chaos and only then can new formal concepts emerge from this chaos.

In fact, we can say that there is between the informal and formal levels a diffuse front where the classes of Facts of the thought/subject are the germs of crystallization of the affections of the thought/object.

In other words, the faculty of combining sensations does not stand at the level of the subject's understanding but at the level of the mind/object.

We are both subjects and objects of our sensations, at the same time spectator of sensation/object and actor/subject of sensation.

This diffuse front obliges us to abolish the difference of nature between the logical/mental/intangible and the physiological (or whatever physical nature) of thought.

Knowledge operates by detachment and not by synthesis.

Contrary to what common sense says, the (formal) facts of the world are not associated with knowledge in the form of sensations revealed as such to the understanding, but on the contrary, they are detached from the global faculty of knowing.

The fact can not be seen without the filigree presence of the knowing subject.

This fact can only appear to the "knowing me".

Without a subject there can be no objects.

At the moment when the fact of sensation is revealed, it is already part of the whole of knowledge of the subject.

To the idea that reason synthesizes the universe of knowledge by disposing, at each moment, one-to-one, the facts of sensation, revealed for themselves, we must then oppose that it is the global faculty of knowing who lets emerge out of it, the fact, as part of a whole conceived and organized globally in the self-object.

Not that we must choose between one or other of the hypotheses, but rather understand how they

cooperate to increase and formalize the meaning of Knowledge.

We see then that the fact of sensation in its form and also its position in the universe of our representation is just as much and certainly more determined by knowledge and its laws than by the possible a priori form of an external cause of the sensation or its position relative to other objects.

Space according to Poincaré :

The concept of space to which this conclusion leads us is close to that of Poincaré: a universe whose form is created as a whole by the mind/object and appears to the mind/subject. An universe where nothing has "by itself" a position.

According to Poincaré (Ref S&H, THP), space has no external reality, nor is it the product of a kind of a specific sensitivity. The properties of space derive from our motor and tactile experiences.

However, sensations have no geometric and spatial character. Spatiality appears to us from associations and orderings of sensations.

Poincaré supposes an innate capacity, a category of the understanding which he names "sensible space" or "representative space" whose function is to classify sensations and to allow the qualitative comparison of sensations of the same kind.

NB: The way sensations are ordained by the faculty of knowing is illustrated in appendix V from the ideas of Whitehead.

The axioms of geometry are conventions, the question of truth in geometry does not make sense, Euclidean geometry is the one that corresponds best to our experience and in particular to the sensations associated with the movement of natural solid bodies.

For Poincaré, the genesis of space is physio-psychological and cultural.

It is at this point that the OK diverges from Poincaré.

It is surprising that the father of dynamic systems theory was content with this typically Darwinian explanation, implying a psychological component under the mysterious label of a "category of the understanding" that he leaves unexplained, as did before Kant and Schopenhauer (ref CRP, QRPR, MVR).

How, could a "category of understanding" indentify and compare "sensations of the same kind" ? This is a typical example of the epistemological error of describing the thought/object with the terms of the thought/subject.

Poincaré, who had seen the constructive character of probabilistic laws and chaos, did not ask the question "what are the laws of the understanding?" from the point of view of logic and very large numbers. It must be said that at the time the field was occupied by the rise of the physiological and psychological sciences of thought.

It is also surprising that Poincaré did not note the circular aspect of a Darwinian explanation underpinned by the notion of a priori time and by an a priori materialistic view of the world.

These remarks made, it remains nonetheless that according to the conception of Poincaré, in a space created by the understanding from various "sensations" and having in themselves no spatial character, the objects of the world do not have "by themselves" position and therefore no speed, acceleration, inertia, mass etc ...

These properties of the object emerge from the global Knowledge of the subject and it is this essential link of the individuated object with the whole of the represented universe, which gives meaning to the ideas of mass, inertia, gravitation, relativity.

For example: The inertia of an object is a mode of its relation to my perspective of the universe: "*If I move an object in my representation of the universe, the whole representation is affected*" "*To move an object, I shall change all my representation* »

appendix IV
Linear system and unfounded reality

Here is an exercise of thought that requires only a general culture in algebra.
This text does not claim any mathematical discovery and its rigor in this respect is certainly criticizable.

We simply wish to use formalisms and mathematical methods for illustration.

A linear system is a set of equations that is expressed as n lines of linear relationships between p unknowns. Typically :

$$a_{11}x_1 + a_{12}x_2 + \dots + a_{1p}x_p = b_1$$

$$a_{21}x_1 + a_{22}x_2 + \dots + a_{2p}x_p = b_2$$

..... ..

$$a_{n1}x_1 + a_{n2}x_2 + \dots + a_{np}x_p = b_n$$

The a_{ij} and b_i are usually given numbers.

The a_{ij} and b_i , which we will symbolically denote by $[A, B]$, express, under a certain convention of writing, a relational system.

Note that $[A, B]$ is the representation of relations and not the relations themselves, so much so that many formal manipulations of $[A, B]$ are possible (eg linear combinations) without altering the reality of the system of relationships.

The x_j are neutral conventional signs for unknowns which we only know to have the n interdependencies defined by the system $[A, B]$.

Under certain conditions, there exists a unique solution, that is to say a unique set of p values x_j that we will designate by $\{X\}$

We can then write $[A, B] \rightarrow \{X\}$

The fact that the solution is unique means that there is logical equivalence or interdependence between the relational system and the solution.

What we can write $[A, B] \leftrightarrow \{X\}$

There is equivalence between the expression $\{X\}$ of solutions and the relational system expressed by $[A, B]$

$\{X\}$ is the representation of $[A, B]$, in a reduced form since $\{X\}$ is a point in the space $\{x_j\}$ (at p dimensions) of the possible of $[A, B]$.

We could generalize the meaning of the x_j no longer as the coordinates of a point in a geometric space but as predicates describing an object in a space of values.

We can then say that the predicate $\{X\}$ is the expression in the ordered space $\{x_j\}$ of a relational system itself expressed by means of the convention $[A, B]$.

The formal representation of the predicate $\{X\}$ describes the same reality as the formal representation of a relational system.

It is interesting to note that $\{X\}$ can be defined formally as an individuated object located in the space $\{x_j\}$ whereas $[A, B]$ is a relational system that can not be represented as an object in this same space.

We find again one of the themes of the OK according to which the Fact $\{X\}$ would be only the representation, by a cut representable in an ordered space, of a coherent system of interdependencies $[A, B]$.

Then the question arises: Is not every point of space $\{x_j\}$, that is to say each of the possible p -tuples, the representation of a relational system of which it would be a solution?

System that can take a form similar to $[A, B]$.

The non-foundation

Analyzing the relational system $[A, B]$ we see that it is formally composed of the predicates A_{ij} and B_i arranged according to a conventional structure.

One would be tempted to express the predicates A_{ij} and B_i in the same sense space as $\{X\}$, but that would probably be a mistake and certainly a way to lose the ontological meaning of our example.

Under certain conditions, however, each predicate A_{ij} and B_i can in turn be considered as the expression, in a certain space of values, of a relational system.

This relational system can in turn be analyzed as the conventional disposition of predicates and so on into an endless decomposition.

Thus, the Logical Fact described by $\{X\}$ in our familiar space of values, would be the representation of an unfounded relational system, a set of predicates contingent to infinity, a signifier without substance.

The reality represented by $\{X\}$ would then be a structure of interdependencies, pure, that is to say without objects, unfounded.

The In-Act

In the relation: $[A, B] \leftrightarrow \{X\}$ The "relational system" $[A, B]$ and the "solution" $\{X\}$ conventionally play a different role.

$[A, B]$ plays the role of the equation and $\{X\}$ that of the unknown solution.

The equation is a set of relations In-act, true of all times and everywhere, without order a priori, independent of any observation.

The solution appears to each of those who perform the calculation, in a time and according to their own modalities and depends on the starting point chosen for the calculation.

Thus, the Reality ($[A, B]$) is In-act, out of time and from all place, while logical Facts ($\{X\}$) appear to the knowing subject as eigensolutions of the Logos, individuated, localized in the time and the space of the subject.

It would no doubt be possible to extend the example to a more general case of infinite system, without a unique solution, and thus to reinterpret the principles of the OK by the formalisms of algebra.

Some very great writers have already written about this kind of exercise (G. Deleuze "algebra and pure thought", A. Badiou "the being and the event"), showing how "mathematically" it is dangerous for the author and difficult for the reader to follow.

Putting its steps in the footsteps of science has all too often deprived metaphysical thought of its necessary freedom and relevance. We will stay there then.

On the other hand, it is possible to draw a parallel between this exercise and the propositions of F. de Saussure (FdS) in philosophy of language (ref PLOC).

FdS explains the concept of sign: association of the signifier (the acoustic sensation) with the signified (the concept), he also shows what is arbitrary in the choice of the signifier, not only in the choice of the term associated with the concept (which is made evident by the diversity of languages), but also by the fact that there is no contingent, see no traceable relationship between the structure of the signified and that of the signifiers.

In fact, the relation of the space of signifiers to the space of signified has structural characters similar to the relation of the space of the variables to that of the equations of the algebraical linear system.

The system of equations is a system of relations, possibly unfounded, infinite, which, if it is not complex in the sense of the OK, is at least of dimension superior to that of the solutions.

This is why they are called "solutions"

None of the figures (numbers) constituting the solution can be associated with an individuated "thing" constituting the relational system but only with the entire system.

We also note that if the solutions are individuated, quantized, the equations represent a continuous relationship between the variables, i.e. the variables are not determined as countable by the equation.

These differences make the solution vector irreducible to the possibly complex logical object that is the system of equations.

It is the same with the language: the signifier is a cut in the signified relational complexity.

The signifier is not in the same space as the signified.

A difference still:

While the system of equations draws its forms in a universe of a priori ordered numbers, the concept (in the sign) is rooted in an infinite, unfounded set of relationships between concepts.

The concept is not "something" but only a more or less vague perspective on a bundle of associations that, in reality, is impossible to pin down. The association of the signifier with the concept therefore requires a judgment of individuation of the concept.

We then understand the difficulty of recognizing the logical structures in a language, as well for the words as for the syntactic rules, because the interdependencies, the relations, which appear to us necessarily between individuated signifiers, are actually between signified, and will present the same structural complexity.

Interdependencies between signifiers will always fail to reproduce the structure of the complex fields of interdependences between the signifieds.

The miracle of language is there, in the Act which, by a series of judgments, makes it possible to individuate concepts in the unfounded space of the signified, of the thought/object, of the Knowledge, to associate to them words, in the countable space of the signifiers, of the thought/subject, of the consciousness.

This miracle is twofold: indeed the signified/signifying interaction is reciprocal: each signifier gives Existence to a germ of agglomeration in the relational complexity of the signified.

Each signifier contributes to structuring the perspective of the subject on his Knowledge.

Language is the structure of consciousness, of the representation of the world, and since, for the OK, the world is representation, language is the form of the world.

Language is not a copy of the forms of the world, the world has no forms.

Language makes Exist in our Knowledge the structures by which we give shape to the world.

The parallelization of language and the representation of the world, the fusion of the two principles, shows us to what extent the laws of Knowledge, the self-created, self-organizing structures of the In-Act build our representation of the world. according to their own law and make the "laws of the world" unnecessary.

The refusal by F. de Saussure, but also by Kant and Schopenhauer of a formal reality in reference to the sign as to the formal representation of the world, has opened the way for us.

The idea of a physical world in reference, although it establishes common sense, is a circular reasoning and therefore without proof, since it would justify the truth of the signifier (the word, the form) by the significant sensation.

The idea that the physical world would be "hardware" with rigid laws while consciousness is flexible "software" is itself wrong. It is not supported by experience or reflection. Poincaré has shown us that, as long as there are large numbers of interactions, the laws of the physical world, would they be elementary and deterministic, are no more rigid than laws of probability, while the cognitive processes perpetuate the individuated subject with an extraordinary persistence, through billions of billions of random interactions.

The signifier is attached to a cut in the signified, the word is stricto sensu a quantum of action of the concept. The meaning of the word is the quantified probability which, associated with the concept, makes it possible to conjecture the identifiable facts that one can experience next.

This is as much for the immediate concept (the horse I see now) as for the general concept (the

concept of horse).

The laws which rule our representation of the world, which seem to us to rule the relations between signifiers, are but the images of the extraordinary complexity of the interdependencies in the In-act. In the proposition <Plato was the disciple of Socrates> the signifier "disciple", which appears to us a relation of one to one, is only the representable image of the extraordinary complexity of the Interdependencies between {what was Socrates} and {what was Plato}; Interdependencies that it would be impossible to circumscribe to the only signified Socrates and Plato.

In the space of representations, the "disciple" relation is not attached to the concepts of Socrates and Plato in their unfounded reality, but to the focal points of the individuation of these concepts, virtual points to which countable sets of conjectures are attached, the laws of probability on the new signifiers that the evocation of these concepts can make exist.

The materialist and monistic view that the "laws" of thought are consequences of the laws of the material world is an assessment error, and so far an affirmation without proof.

Quantum theory shows us that the world that we believe to be deterministic when it comes to describing it by the signifiers of Facts and Relationships, is in deed probabilistic.

The countable and dicible laws of the world of our representations emerge from the laws of the individuation of meaning governed by the principle of the Logos.

The acoustic image of language, the formal sensation as well as the law, are in their turn the germs of the individuation of the concept, in a reciprocal action, not of the sensation (or of the word) to the concept, but of the whole formal sensations (see note) to the indistinct and metastable mass of concepts, ie to interdependence.

The laws of this "crystallization" of concepts from germs are probabilistic, transcendent and universal, thus explaining the similarity of structure of languages and representations of the world and the place left nevertheless to divergences, to choices.

The example of physical crystallizations (which we owe to G. Simondon) is quite suitable: the principles are universal and the structures are similar, depending nevertheless on parameters of substance; however, each crystallization is unique and no contingent logical relationship can be established between the resulting image and that of the original substance.

What "makes law" is the mode, the principle of germination and not the "class of germs".

It is in virtue of the principle of germination that forms appear to be classifiable, that there are invariances, figures of crystallization.

Crystallizations from the same substance with the same parameters, although each is unique, are immediately identified as similar.

The relation between signifier and signified is necessary. We have shown that it is reciprocal but that it links two incommensurable universes: the countable universe of signifiers and the unfounded universe of the signified, the equivalence of the signifier to the signified can therefore only be a judgment, an extended form of contingent predicate to infinity.

This relation does not require at all the existence in reality, of a formal referent to the word or the sensation.

(note) About the interdependence of sensations: The set of signifiers ultimately expresses the existence of the "I", as an asymptote to the aggregation of meaning.

There can therefore be no void of meaning, except to question the certainty of the "I", which is impossible.

Every individuation of meaning, in that it replaces the complex (the excess of meaning) with the countable (the meaning Unit), occurs in opposition to the emptiness it creates. If individuation punctually releases the tension of an excess of meaning, it creates a new tension because it can not create a void-of-meaning.

Under the general constraint of the 100% certainty of individuated Facts and finally of the "I", these logical tensions are resolved according to the same principles:

Transaction is a projection from a space to another space of lesser dimension. Transaction takes the

100% certainty (for itself) of the Fact F_n , taken in the complex space of its In-act, to pass it as a conditional probability of a Fact F_{n+1} , "knowing" $F_n : P(F_{n+1} | F_n)$ in a space of lesser complexity (see appendix V for more details).

At all scales and always with the "I" as the ultimate focal point, Individuation gives to the representation of the world a sort of fractal structure.

appendix V
The fact and its importance

A.N. Whitehead (Wh), philosopher and mathematician, is with B. Russel co-author, in 1910-1913 of "Principia mathematica", a founding work of modern logic and arithmetic.

In 1938 Wh gave 9 lectures presenting his metaphysics, whose texts have been grouped into a collection entitled « Modes of Thought » (ref WMdP)

In the following lines, we will start from the notions of "Importance of the Fact", theme of the first of these lectures and "Perspective", theme of the Fourth, which we will reinterpret according to the terms of the OK and then try to go beyond them to draw conclusions applicable to arithmetic and geometry.

Let's start by solving two vocabulary details:

(1) The term matter-of-fact: We will rather use the term "Fact" as defined by the OK, as it may be involved in the terms "Fact of Knowledge" or "Fact of Sensation"

(2) The terms "being connected" or "connectedness". We will prefer "Interdependence" which is well defined by the OK.

Development

Wh first states that *"There are two contrasted ideas which seem inevitably to underlie all width of experience, one of them is the notion of importance...The other is the notion of matter-of-fact"*. We will see that in this quote, the expression *"all width of experience"* is not incidental.

For Wh, the importance of a Fact is not a mere judgment (would it be unconscious) of the subject, applied as an attribute to the Fact existing by itself. Importance is a condition associated with the appearance of the Fact in the perception of the subject, its Existence as the OK defines the term.

"... characteristic modes of thought as we first recall ourselves to civilised experience are "this is important", "that is difficult", "this is lovely" etc."

For Wh, here is no surprise that one can qualify as "important" a Fact even though it is only vaguely characterized by the terms "this" or "that", for importance is not a mere qualifier of the Fact.

Not that importance is a prerequisite for the Existence of the Fact.

As the OK shows, since the Fact has no substance, it is the association of meta-Facts, of judgments of belonging to classes of Facts. Thus, judgments such as unity, importance ... co-exist in the Fact, like all the meta-Facts that constitute it. Importance co-Exist in the Fact.

As an illustration, a movement rapidly converging towards our axis of vision triggers in us a physical state of alertness, even before it has been individuated as a Fact of perception and acknowledged as "a danger" by our spirit.

Having shown co-existence in the Facts of the importance judgment, Wh then exposes the nature of importance, beyond its usual psychological meaning.

For Wh: *"the notion of a mere Fact is the triumph of the abstractive power of the intellect" "A single fact in isolation is the primary myth required for finite thought, that is to say, a thought unable to embrace totality (3)"*

(3) This term of totality would have deserved more precision. We propose *" ... the totality of its Knowledge "* or *" ... a thought/subject unable to give meaning to the totality of his thought/object "*. Knowledge and thought/object designate here the same notion.

Wh: *"This mythological character arises because there is no such fact. Connectedness is of the essence of all things "*

We will move from Interdependence inside the Fact to come to the Interdependence between the Facts of Knowledge and its role in the constitution of a perspective that will make possible a judgment on their respective importance.

For Wh, the judgment of importance is that aspect of our feelings of the world by which a

"*perspective of the world of things felt*" imposes itself on the subject. It is according to this perspective that our consciousness neglects such unimportant Facts and gives Existence to such important facts.

"The two notions of importance and perspective are closely intertwined."

The importance of the fact lies not "in" the fact but in the global relational structures that determine the modes of judgment of importance and is called perspective.

One could consider that importance qualifies the individuated Fact while the perspective describes the scheme of a structure in the Knowledge of the subject. This simplistic vision should not make us forget that on the one hand the importance is a relationship of "more or less", relative in essence, order relationship between Facts, necessary to an orderly structure; and that, on the other hand, the perspective is in the proper sense according to a point of view: that of the subject.

At this point, the reader of Wh's lectures feels the same discomfort as when reading Kant or Schopenhauer. As long as the terms: importance, perspective, judgment keep a psychological connotation, nothing is clear.

The OK proposes to the reader, by explaining this notion of "point of view of the perspective", to deepen the intuition of Wh to highlight by which objective process the Facts of our Knowledge seem to emerge in a space ordered by the importance and more generally by order relationships.

For this, let us quote a somewhat obscure passage from Wh: "*We may well ask whether the doctrine of perspective is not an endeavour to reduce the concept of importance to mere matter-of-fact devoid of intrinsic interest.... It is true to say that perspective is the dead abstraction of mere fact from the living importance of things felt. The concrete truth is the variation of the interest, the abstraction is the universe in perspective, the consequent science is the scheme of physical laws which, with unexpressed presuppositions, expresses the patterns of perspective as observed by the average of human beings*".

According to Wh, perspective results from systematization, in the form of laws, of invariances of structure (patterns) in the importance of Facts of Knowledge, as felt by the subject.

For the OK, Wh's analysis lacks the following premise: "*The subject is individuation of his Knowledge*"

Let us recall some principles enunciated in ref. OdC: The Logos tends to aggregate the Knowledge of the subject into individuated singularities that are the Facts of Knowledge which, themselves, being interdependent, will be aggregated in turn and so on into a global process of individuation that converges to an asymptote : the "I", the knowing subject, the Point of view. The meaning of each Fact is expressed by a law of probability on the Facts to appear.

From a global view we can say that the agglomeration of the Facts of a Knowledge, by its convergence, gives Existence to the subject. It is the individuation of the subject.

G. Simondon has clearly stated (ref ILFI, IPC): The subject is not the result of individuation, it is the principle, the Act of individuation. Individuation does not end with the appearance of the subject. The convergence is perpetuated indefinitely towards the always repulsed focal point that is the "I". Thus, the flow of appearance of the Facts and their agglomeration "towards" the "I" is endless.

This convergent agglomeration is not regular.

The contributions to the individuation of the "I" are not equal.

The conditional probability of Existence of the subject, knowing the Existence of a Fact is not the same for all Facts.

Existence of certain Facts is objectively more important than others for the Existence of the subject. The importance is therefore not a psychological or physiological phenomenon but a distribution of objective probabilities in a system of interdependencies.

It is the probability of Existence of the subject knowing the Existence of the Fact.

According to the same principle by which the Facts are individuated, singularities in the importance

of the Facts appear and subsist. They individuate in meta-facts of importance.

The dynamics individuate and persist, as the convection in the atmosphere is individuated in cyclones and anticyclones.

Importance is not an exclusive attribute of the Fact, according to an absolute scale, but a characteristic that judges the Fact as one of the Facts, from a perspective of which we now know that the point of view is the "I".

Now, by virtue of the Cogito, the Existence of the subject is certain for the subject, in essence.

It follows that the sum of the importance, integrated over the whole extent of his Knowledge is equal to one for the thought/subject.

Importance is only one of the modes of Existence, one of the formal elements that coexist in the Fact and carry the meaning.

Importance is only one way of qualifying the remarkable singularities resulting from the Logos.

It is here that the remarkable consequence emerges.

In a reality according to the OK, which would not be ruled by physical laws a priori but by the laws of Knowledge, by the principle of the Logos:

The world of the subject is not the juxtaposition of Facts disjoint, with an absolute Existence, possibly ordered according to a priori scales.

The meaning of the world is not a possibly infinite addition of independently existing, or loosely interdependent, meanings of Fact.

Since the Meaning of a Logical Fact is the assertion of the Existence of the subject, the world is a set of Facts whose cumulative Existence results in the certainty of the Existence of the subject.

For the representation of the subject, the world is distributed according to a distribution of probabilities of Existence whose integral on the totality of the extension of his Knowledge is 100%.

This distribution is not equal, it is even metastable according to the principle of individuation.

There are singularities.

From the global interdependence between the singularities, the Logos' laws define, according to a perspective centered on the subject, the rules and the parameters that order the representation of the world.

Thus, the limitations to the extent of the world as it appears to us, our inability to qualify the infinite to large and small scales, result neither from insufficient means of observation, nor from an intrinsic limit to the world, but from the fact that the Existence of the world is included in the Existence of the subject, the totality of which can not exceed a mere certainty.

This principle can be expressed very concretely: In order for the subject to be able to make A and B exist in the same representation, the In-act of A and that of B can not be disjoint, then the Senses of A and B, expressed in terms of conditional probability of "I" do not add up completely.

Such a conclusion is not without consequences on the validity conditions of arithmetic and geometry.

Arithmetic: If we consider the number (integer) as the Fact of arithmetic, then only pure numbers, numbers which would be nothing for the subject, numbers with a zero Existence can constitute an infinite according to the classical principle of recurrence. Of such numbers nothing could be said. In particular their importance would be nil ($1/\infty$) and therefore uniform, as moreover it would be impossible to attach to them the sense of the logical operations which define them, these numbers could not be ordered.

An arithmetic of numbers with non-zero existence should respect the above stated constraint: that the integral sum of the existences of numbers, extended to the whole field of this arithmetic, is limited to 1.

Let us say that if the conditions necessary for that each number n can be represented by the subject, occupy a fraction F_n of its existence, the series will be limited by $\sum F_n \ll 1$

One can probably conceive several classes of solutions respecting this constraint, that they limit the

extension of the domain or the density of probability of Existence. I even suppose that they have already been elaborated for the solution of relativistic and quantum problems.

Geometry: If we consider the point as Fact of geometry, then only points with zero Existence can populate a continuous and/or infinite space. This space could not be ordered.

The constraints that would impose to points with non-zero existence, to "physical" points, would be of the same types as for the numbers of arithmetic.

I will not venture on this terrain.

It can be argued, however, that the solutions to this constraint:

- Will be centered on the subject

- The Facts will necessarily be without substance, unfounded. In other words, in these facts, there will be judgments of structure, singularity, and importance. They will possibly be defined only by intersections of classes.

- The Facts will be interdependent so that:

$$\sum_i P(\text{subject} \mid \text{Fact}_i) \ll P(\text{subject}) = 1$$

In conclusion :

It is remarkable that this Mode of Thoughts was written (in 1938) by the co-author of Principia mathematica (written with B Russell in 1910-1913).

In purely ontological terms, it will be noted that it is not the "totality" or "cardinality" of a world being which is limited in reality, but the Existence of the world which is limited to the Existence of the subject by the laws of the Logos .

Only the representation of a world is limited by an horizon.

Any question of form related to what is beyond this horizon is useless.

Should we deduce a new cosmology?

This text has brought us an objective answer to two questions concerning the OK:

- How, among the infinity of infinities of actual orders, a particular order is brought to Exist for the subject ?

- What is the principle of the relations of "more or less" that will order and qualify the individuated Facts?

In philosophical terms, this throws light on Kant's "*in mundo non datur hiatus*" in his "Critique" ref CRP:

A hole in the representation of the world would be for the subject a quantum of uncertainty about his own existence. But such uncertainty is impossible under the Cogito.

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