THE LEFT HAND OF CHAOS

(MODERN AND ANCIENT INDIAN ANALYSIS)

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PROLOGUE

This essay is basically about philosophy. Samkhya, which is the oldest Indian philosophy, had a decisive influence on the development of Buddhism. We will use its viewpoints to tackle a wide-ranging physical and mathematical question, related to chaotic and complex dynamics. The Samkhya is an exact, mathematical philosophy, applicable in any order of the experience, and therefore, also it has use in the more controlled experimental dominion. The Samkhya studies the waves or fluctuations of any movement, being the mind only another form or order of the movement in general. And although the main intention of Patanjali is the self-observation or direct perception of the fluctuations of one's own mind, with the intention of reaching the balance and the possible cease of its movement, also we can apply this frame to behaviours of experimental and measurable order, one of which is the sanguineous pulse. This is what did millenniums ago the ayurvedic medicine, although, of course, in that case the quantitative considerations were secondary. We are going to take all this farther, and will try to show that the relations between the Samkhya and the modern mathematical analysis, including in this one the science of dynamics, are real, deep and inevitable.

The book consists of two parts. In the first part, titled "Pulse and time", I show that the *triguna* and the *tridosha*, the three modalities of the conditioned nature in the context of the Samkhya, is nothing but the most general expression possible of the three laws of the movement of Newton and modern dynamics –the most general, because they are applicable as much to open systems as to closed or ideal systems, being these the limit of the first. But the same relation between open and closed systems will take to us much farther, to the borders of the analysis and the present physics, including in the word "analysis" even number theory, and being the utter Arithmetic the closest discipline to the pure scrutiny of time. This it is the subject of the second part, titled "Time and the modern science".

Being aware enough that these subjects are as vast as difficult, I have decided on a exposition pointed with historical motifs; which does not mean at all that this is a book on the history of the subject, but rather that the history, in which always our imagination concurs, allows us to assimilate thoughts, movements and currents not only more easily, but also more deeply when we have a suitable perspective. And, precisely, some of the things appearing are so little evident that even the historians have not repaired in them. But, for me at least, the history itself, always ambiguous and doubtful, has much of nature –of a nature that rarely we manage to contemplate.

"The left hand of chaos" alludes to this rarely contemplated aspect of nature, so related to time, beyond the conventional space of dynamics. The same term "chaos" is taken in a larger meaning than the one of the so called deterministic chaos, which arose from the instability in the solutions of differential classical systems; if we contemplated its "left hand", the same chaos would be diluted in something very different, but not necessarily controllable.

Not at any moment I have entered details or technical precisions, which would exceed the intention and the reach of the essay: which is to illuminate and to help to conceive new possibilities in our idea of nature, considering the always decisive limitations of our mathematical models. A correct contemplation will help us to surpass some of these limitations, because if by one side we do omission of the technical difficulties, we also indicate the experimental frame in which these have to reveal themselves with all property. What the human mind can not imagine, offers us the nature very often with insurmountable naivety; and in the present labyrinth of sciences of the complexity an Ariadna thread like this one is missing. Nature ignores the analytical difficulties, and here we are going to find a good example of something that can be simultaneously much more simple and much more complicated that what the most sophisticated techniques allow us to describe: it will be up to us what part we prefer, knowing well that here completely new considerations are introduced on which it involves the prediction and the reconstruction of the events. The present models of prediction and reconstruction are close to the collapse and it is absolutely necessary to reframe what is possible to wait for of them, since often the own expectation of the prediction or control extinguishes the possibility of understanding of the phenomena. This subject is consubstantial to the development of the whole text, although barely it becomes explicit: it has to manifest itself in the most concrete of the planes.

Therefore, this book is not merely speculative. It makes a decided bet for the experimental contrast of its ideas. The ideas are difficult to expose and to grasp, but the experiments are easily attainable worldwide. What there is to verify or to refute is a certain duality in the behaviour of the pulse. Such duality seems to be treatable more easily by the study of the correlation of the pulses of both wrists; but it is not in that that the duality consists. This one simply indicates the distinction between *prakriti* and *vikriti*, the initial and secondary components of the joint evolution of the system. If we managed to define these in a satisfactory form, we will have given a great step, because what it is at stake is not another thing that the frame of reference for the evolution of dynamically complex systems; and these, nowadays, include practically everything.

This text was written originally in Spanish, my mother language; being my English very limited, I apologize for my translation.

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FIRST PART

PULSE AND TIME

1

It seems to be that in the West the only idea of legitimate science is the one derived from the Greeks. In this line, any description of the world must be external to us, and consequently, objective. All other description would fall within the subjective, when not "mystical", interpretations.

Nevertheless, modern science is something far away from the Greek spirit. Two are the great events that mark this distance. First, the appearance of an experimental purpose with respect to the Nature, that arrived at medieval Europe through the Arabs, and in particular, through the alchemy and pre-chemistry - although also through works about optics. Secondly, it was the introduction of the zero with positional notation, of Indian origin, that completely transformed the possibilities of the calculus and, in the long run, the whole face of the mathematics. Each one of these elements, completely alien to the Greek mentality, has influenced so much in modern science as the own Greek idea of rationality; so that the vindication of the Greek origins of science, even being legitimate, has always more rhetorical and romantic elements than we commonly admit.

In XVII century, and since Galileo, the notion of change and movement and the notion of infinite decimal expansion were interpenetrated and from it began to outline the concept of *function*. In this connection, something very important became from the *inside* to the *outside*: the idea of the change itself, that earlier was internal to the same matter –or to the substance, if we prefer- happens to be external and spatial by virtue of its mathematical expression. Thus, by a peculiar transposition, it returned to become present the Greek ideal of knowledge like external representation, although it was precisely Greek authors, like Aristotle, those who were challenged. But, in an intangible and fundamental way, and in the middle of the mathematical formalism, the notion of displacement and change was inherent to the positional zero notation within the infinite decimal expansions –and in a so subtle, incommensurable and elusive way as it could correspond to the same use of the zero. In this same displacement the idea of the movement released of any material considerations was already implicated. And thus the modern conception of "real" numbers begins also.

In this crucial recombination, the own ideas of space and time adopted a completely new and unexpected character. So new, that not even today, accustomed already in our imagination *the new representative style*, we can understand entirely its consequences. On the one hand, the Galilean principle of relativity deprives of any meaning the notion of location, of point in rest in the space –the same rest no more exist, since it is indistinguishable of the uniform movement. By the other hand, and as a result of it, the variation in the time and its rate become the authentic measuring rule –but this, at the cost of turning to time itself something spatially represented, and for that reason, completely passive and deprived. Galileo himself discovers and invents the pendulum. Without real alternation no time is possible. But, being the alternation of the pendulum independent of its amplitude, the model is lent naturally to its idealization, being totally turned

into space. Eliminating any content in the alternation of the pendulum, what Galileo invents in fact is the "one way pendulum". This inconceivable object is the one that governs as much the form we imagine the time as governs in our clocks. Or at least, in our form to represent it: because it is difficult to see how it could affect to other layers of the imagination than the most superficial ones.

It has been said that the linear time and the idea of history are Judeo-Christians notions, although the certain thing is that they have arrived to us through Zoroastrian Iran. Nevertheless, the historical and irreversible time, as we have felt it in the Western world in the last centuries, must much, if not most, to the idea of *reversible* time of the mechanics or dynamics. How this, that we know positively certain, can simply be possible? Because the "one way pendulum". But if in physics the idea of irreversibility –the so called "arrow of the time"- is not opposed at all to the reversible time of the mechanics, nor it adds nothing –as Prigogine seemed to presume -, but it is simply its other inevitable face, Where to watch? Our simple and not ironic answer is: Not onwards or backwards, but towards the sides; to our right and our left sides. Preferably, before we make the least movement. Not even mental. Certainly, it continues seeming difficult.

2

"*Tatah punah santoditau tulia-pratiaiu cittasiaikagrata-parinamah* ", may be translated as: "The concentration takes place when the mental waves that rise and fall at two different moments are exactly equal".

What more striking seems to us in the first reading of the *Yoga sutras* of Patanjali is its exact and mathematical character, even though it is speaking simply of the spectrum of possible experience for any man with the necessary dis-attachment and discipline; not only exact and mathematical, but, properly speaking, *analytical and infinitesimal*. No work written with its antiquity, about two thousand years, offers something similar. I would say that neither the mathematical works of Archimedes, nor his *book of the sand number*, contain a similar aroma.

Archimedes and Apolonio did not know the zero, and many say that this was what the main obstacle to attain the modern calculus. In fact, they also needed the other essential element, a different idea about the movement and the time. Patanjali did not know the zero and its explicit operations; but he knew well the idea implied - and, apparently, more enough than the mere idea. In addition, which he left written on the movement and the change is of an impenetrable depth, but with an impeccable implicit logical articulation.

Certainly Patanjali was not a mathematician nor a physicist; not even a "psychologist", as he is often dispatched trying to ignore what he is saying in the clearest form: "the things exist as much if the perceiver perceives them as if not", to admit which does not need to take refuge in any of the pretensions of the realism. Patanjali is simply a philosopher, who prefers to leave us his conclusions instead of write to discuss them. Its subject is the human experience and what underlies in the change that makes it possible; nothing more, nothing less. What, naturally, it implies the time, the movement, the nature and the appearance, with the basic definition of its mixture, predominance and proportions. Therefore, it includes everything with an extraordinary economy of means. But, peculiarly –and here is all the difference with the modern western thought -, this is only obtained with a determined position, that consists basically in not to make the smaller distinction between internal and external, subjective and objective phenomena. For that reason it does not make sense to describe Patanjali like a "psychologist". His thought and vision are beyond any ingenuousness.

3

To many our association of capital parts of the classic Indian thought with the spirit of the analysis will seem totally unfounded. Perhaps they ignore that Indian mathematicians like Madhava of Kerala discovered the so called Taylor series –used before by Gregory, Newton or Leibniz- nearby the year 1400. As it is well known, these polynomials in power series are the spine of the calculus. Madhava was the first

mathematician who made the infinitesimal passage to the limit; almost surely, he arrived at this extreme by his work with continuous fractions. Or that Aryabhata the great, who lived by the year 500 and before Brahmagupta –who gave us the rules to operate with the zero -, discovered the continuous fractions, virtually infinite, that was one of the preferred instruments of Euler or Gauss, and that still today give many surprises in pure mathematics and in the analysis of resonances in chaotic and complex dynamics. The continuous fractions, series themselves, are in the origin of the analysis. Aryabhata, almost with complete certainty, worked already with the notation of the positional zero. Between a great number of achievements, he advanced the incredible conjecture that the orbits of planets were ellipses. Or that Srinivasa Ramanujan –who also had a noticeable preference by the continuous fractions - discovered the functional equation of the Riemann zeta function –summit and abyss of the superior analysis- in India by himself and without another stimulus than the Carr's elementary mathematical text book. Ramanujan barely had the smaller idea about the complex variable theory. Surely, so improbable facts are not merely coincidences. But the masterpiece of Patanjali it is the most forceful and powerful argument, for those who can read, and if we attend to the spirit of the analysis itself.

We forget easily enough that the idea of the infinite and the infinitesimal is inconceivable and unmanageable without the zero, about which the Greek mathematics are the most evident proof. And we also forget that the idea of the infinite and the infinitesimal are *a double* idea since the beginning, and therefore, irreducible to the simplicity or unit. Being so, the zero remains for us a kind of immanent immovable motor, even within the most neutral of the formalisms. Nobody says "it tends to be equal", but says "it tends to zero", or, on the contrary, "it tends to infinite", subsuming the highly fragile concept of equality within the much more comprehensive and powerful one of *tendency*. To specify a tendency is all what underlies to the concept of function. Therefore, the zero released for always the notion of tendency, contributing to the same method of the calculus the idea of power of resolution. Our own idea of the identity is safeguard by the one of tendency. And the same zero allows us to tolerate the ambiguity, displacing it. Thus, it is easy to see that the great step and the great difference that separates the modern science from the one of the Greeks is just the imponderable zero, the great Indian contribution, so difficult to estimate always.

Simplifying the equation:

Greek mathematics + 0 = *modern Analysis*

That anybody will interpret as can.

One will say, and it is completely certain, that the Indians never got to develop the analysis applied to physical sciences as we understand it, and that, for the same reason, they could not develop it systematically neither with any comparable degree of generality. But this fact not only doesn't contradict our perception of the subject, but reinforces it considerably. Then what we suggest is that the analytical mentality was something connatural to certain layers of the Indian culture, but not that this one showed inclination to a science like modern dynamics, that must start off from the assumption of an inertial frame. This type of election was completely alien to the India culture, like to all the others, except for the western one. But we do not have why to confuse the analysis with dynamics, although for western people such association becomes unavoidable.

Already the identification by Copernicus of the Sun as centre of the astronomical system implies that inertia like fundamental property has been chosen; and it is the renovation of this election the one that has supposed its triumph between us, unlike the Greek contemporaries and later to Aristarchus. To the ancient peoples any imaginable property of the celestial bodies would be more worth of interest than inertia. Newton gave an answer in form of law to a question that had become something interesting; but if other peoples did not discover such laws, we must remember that they did not have the smaller interest by them either, nor they never looked for them under such clothing.

Said this, we can recognize that the analytical spirit in the ancient Indian culture responds to other interests that the ones of modern dynamics: what it is not at all equivalent to say that loses interest on the movement and the time. What it does not share is the outer and spatial representation of these. As we just have said, it is not necessary to confuse the science of dynamics with the analysis. This last one is a much more timeless object, with its own movement. The arithmetical functions, like the Riemann zeta function, give the most magnificent example to us. And who would affirm that Arithmetic nothing has to do with time? Later, we will try to see towards where this leads to us.

4

Patanjali's *Yoga sutras* are the maximum exponent of the Samkhya. *Samkhya* means *analysis*, *number, measurement, proportion, detailed scrutiny*. In any case, the Samkhya was the more purely analytical of all the Indian philosophies. It existed developed before Buddha was born, and his founder, Kapila, could live at a time even previous to the birth of Pythagoras, although in dates quite near to those of the birth of the Greek philosophy.

The Samkhya is the philosophy that underlies to the Yoga, so that its subject only can be the equilibrium or balance. Everybody is more or less forced by life to maintain different balances, apart from to aspire to it in the most general form; so that neither yoga nor the Samkhya is alien to any of us, even if we believe to ignore them completely. Otherwise, and in the form of conservation principles, also for the science of dynamics the balance is the fundamental subject.

5

The Samkhya, whereas the study of the oscillations of the mind that possibly can be lead to the rest, is an intuitive and perfectly direct theory of the fluctuations. But the modalities or moments that detects in the fluctuations cannot be purely extrinsic, but internal or inherent, the discernment that only characterize them opens passage in as much the mind is contemplated or testified by the immovable consciousness without attributes. It does not exist in this any contradiction, but continuity, since the characteristic movement of the mind in its passages of acquisition of knowledge results from so many other passages of easement and therefore of relative or tangential contact with the same knowledge as source; we will see that this solution of continuity is the subject par excellence of the Samkhya as well as of any approach to it.

6

For the Samkhya, all the material or conditioned nature is reduced in last instance to the fluctuations of the three *gunas* or modalities. These always act of conjugated form, so that we cannot perceive them in its isolated and exempted form. In the middle of them and beyond them it is the immutable and unconditioned, *Purusha*, the consciousness without qualities neither attributes.

7

The three *gunas, Sattwa, Rajas, Tamas*, are, in their primary form, sensitivity, activity and inertia. Or if it is preferred, balance (relative), mutability and potentiality.

On the matter of the mind, it is possible to say that it is not an exclusive attribute of *Sattwa* or the

sensitivity, but that the own mind, although is more clearly manifested under the aspect of *Sattwa*, contains inherently associated as much the activity as the inertia. The three *gunas* are included and present in any object or subject that we want to isolate: therefore the *gunas* or primary qualities are those that cannot be isolated at any moment, except by the momentary or relative dominion that one of them always exerts on the other two.

8

Let us take a paradigmatic example from *hatha yoga* to conceive in an immediate manner the conjugated character of the three *gunas*: the position of remaining in balance on the head, with this one putting in the centre of a triangle drawn by the forearms (*sirshasana*).The novice has therefore the opportunity to retake the hard learning of the balance that as much work gave him when babe and that he forgot completely precisely because it has managed to incorporate it. In the beginning, it will be basically at the mercy of inertia; with something of practice, it will learn to make the necessary force to resist the oscillations of the body. This force will be excessive nearly always and bad applied, until gradually it is developing sufficient sensitivity and the unnecessary efforts are avoided to the maximum. After a variable period of practice, a more or less optimal union of inertia, forces and sensitivity is reached: then not even a special alert of sensitivity is precise, because it is completely integrated with the other two tendencies. A spontaneous state of suspension takes place finally, that nevertheless is the fruit of all the previous efforts and deliberations. Even if we took the work of even measure in detail the oscillations that within a circle make the body of the novice and the one of an experimented, and for identical deviations of the centre in any direction, we would verify the enormous difference throughout the vertical axis with respect to the rigidity of the first and the perfect and synchronous undulation throughout the body of the second for the most effective and coherent accomplishment of the principle of least action. This is an excellent illustration of that lost dimension of the movement to that we alluded; as well as of which we understand by incorporable or assimilable knowledge. To that process of concealment in the invisible of the qualities in its total presence is at which it points the experience of being in the Indian philosophy. Such experience allows the participation in the extra-mental with no need of metaphysics.

In addition, this example offers a demonstration to us of a principle that is always valid in Samkhya: to greater sensitivity, greater stability and lesser conditioning. But so that this sensitivity is so, and not an added source of perturbations, that has had to integrate *in act* the other two present modalities.

This principle, highly conditional, of greater stability to greater sensitivity, is of extraordinary importance, for example, in Biology. But its generality could extend further on.

9

Another immediate form to consider the *gunas* or basic modalities is taking care of the nature of our hunger or inclinations. These are reduced in last instance to only three: the laziness or inertia, the activity and the pleasure. A momentary predominance of one of them always occurs, which is proper of their excluding character. The laziness corresponds to *tamas*, the activity to *Rajas*, and pleasure to *sattwa*. Although *sattwa* is the more elevated modality, the fact that it exists with attachment reveals its conditional, natural character. Why the attachment to the pleasure? Because the pleasure secretly looks for the balance between the activity and the inaction. This way, sensitivity or *sattwa* becomes the leading reason for the evolution of all beings conditioned by the three *gunas*, in search of the unconditioned balance, *Kaivalia*.

For the Samkhya, the modification of *gunas* is the only causal principle that exists in nature. That is to say, there is no other cause that the change of the *gunas*.

10

But the three *gunas* or modalities also find their total correspondence in dynamics; and precisely in the three laws of the movement and the mechanics, enunciated for the first time by Newton. Perhaps then it does not define the first law the rest and inertia, the second the action or force based on the first through the mass, and the third the balance between action and reaction? Yes, *Tamas* is in correspondence with the first law, *Rajas* with the second, and *Sattwa* with the third. But a great difference exists. In classical mechanics, the action and reaction are simultaneous and immediate. In the Samkhya, such a thing it is not refused nor affirmed; simply, is not considered.

The third law is the safeguard of the conservation principles. But, in addition, it is the mean to establish the absolute time like principle of global synchronization. That is to say, this one is affirmed as a fourth implicit principle, although it remains beyond any evidence: like an assumption of metaphysical character. This way, the Newtonian absolute time plays the same role for the three principles that the unconditioned consciousness or *Purusha* for the three *gunas*.

Therefore, Newton's third principle eliminates any means or real mediation in benefit of synchronous instantaneous reactions. This way, it is consolidated and closed the purely mechanical description of the change and the interaction between objects. Literally, there is no space –nor time- for anything else.

This combination of the third principle and the different laws of conservation that are their corollary with the absolute time or global synchronizer conforms what we understand, or rather we guess, as *causality*. But it is to notice that the causality never is defined explicitly –because it can not be defined here.

The principle of global synchronization is completely conserved in special and general relativity, by means of the Lorenz transformation and the notion of covariance. It is for that reason that in these theories is often spoken about the "principle of causality", although it is not defined here at all, but only understood under the assumption that the events "located" in the future do not affect to those "located" in the past. In quantum mechanics, no longer is possible to speak of causality, although the conservation principles are assumed; that is to say, a Newtonian interpretation of systems completely different from classic properties remains to a great extent.

One assumes that the three principles –with the fourth implied- are suitable precisely because they define an ideal or closed system, so that it is always possible to be continued at the time of verifying the details. But what it happens soon it is generally quite different: the details are studied to fit them with the previous idea of general balance. This way, the behaviour of statistical mechanics or thermodynamics can be sent to the part of the quantum mechanics that ignores temporal problems to give back the balance of accounts to the classic mechanics without touching it. This way, questions that are considered like irreversible within the thermodynamics, are camouflaged in a peculiar game with three bands: the classical mechanics, the quantum mechanics, and a thermodynamics that only nominally deals with the irreversibility subject.

If we thought in terms of information, for example, we could think that there is no better definition of the information that the one of inequality between an action and a reaction. Local asynchrony would be the most appropriate measurement of the communication or mediation.

11

The three laws of the movement become transformed, through the more modern variational description, developed among others by Fermat, Leibniz, the Bernouilli, Euler, Lagrange, Jacobi or Hamilton, in the principle of least action, also denominated of extreme or stationary action.

Poincaré, more than one hundred years ago, already made notice that any physical model that can be described in terms of the least action –a gravitational or electromagnetic system, for example, allows in fact infinite causal explanations. It could be explained by means of elastic rubbers or springs, or any picturesque

device that we wanted, provided it satisfied certain requirements –precisely those of the stationary action. That is to say, it does not define the causal relation at all, since this one never can be unique. This is the main reason by which the physicists prefer to speak in terms of descriptions, predictions and equations; although, finally, few of which use these terms will doubt to have catch the true causal nexuses.

That the principle of least action is bottomless from the causal point of view, is something that cannot be strange to us. Since it has been noticed sometimes –and particularly by Nikolay Kozyrev -, the classic or Newtonian mechanics, in virtue precisely of the third principle of the movement, always contemplates a *space* interval, by arbitrarily small that could be, between a cause and an effect, or between an action and a reaction; but it does not contemplate any *time* interval, by arbitrary minimum or that is. That's to say, this is the only cause of the causal lapse. For the Samkhya, nevertheless, *a real* time interval does not exist that is not constituted itself by a modification of the *gunas*; therefore, it is natural that vindicates these like the unique cause of the phenomena.

Of course, quantum mechanics, unlike classical mechanics, contemplates minimum times of reaction for the interaction between particles. But, exactly here, in the quantum dominion, it is where the causality principle is eluded, seeming completely inapplicable, in benefit of a probabilistic interpretation –although according to some aspects physicists speak of the unitary or determinist evolution. This way the problem again is avoided, and sent towards another part.

On the other hand, the principle of minimum or stationary action always seems to introduce a teleological aroma in the description of a system, since this one appears guided somehow by the purpose. Nevertheless, we must consider that this uncomfortable appearance arises precisely from a time model that, like our "one way pendulum", *simultaneously* imposes the reversibility of the actions and reactions and the idea that these occur in an irreversible direction. That impossible pendulum is the nucleus of all our paradoxes. The physicists use three different physics to better elude that impossibility.

12

Let it be so, at least for the moment. It would be thought that the Samkhya, being a self-observation discipline, does not have anything to do with the empirical dominion of the external facts. But the Samkhya conceived at least one purely empirical science, to which few moderns, nevertheless, would give value enough. This science was the *Ayurveda*, the science of the care of the life, not very distant in the spirit of other old medical arts, like the Hippocratic medicine or the Chinese. What distinguishes its humoral theory is to be an application of the frame of *gunas*. Three humours or *doshas*, *vata, pitta* and *kapha*, or wind, bile and phlegm, are not but reactive forms of the inherent properties of sentience, activity and inertia .By reactive it has to be understood that its predominance on the other properties is able to generate imbalances and ailments throughout the time; but also that they are a secondary or derived form from more original and less privative modalities in the constitution of the subject: *prana, tejas* and *ojas*, the vital breath, the brilliance of the combustion and the radical oil that permeate and nourish the body. We are then in front of much more material qualification of the *gunas*, but not for that reason less subject to the same fundamental logic.

The influence of the ayurvedic concepts in authors like Plato has already been noticed enough by the scholars, in particular in the *Timaeus*, where it is clearly spoken of the "air, phlegm and the bile", apart from to mention "the established periods of the life… in conformity with the triangles of the nature of each one". It does not stop being peculiar to verify how this book of mysterycal roots and pole of the enlightened hermeticism has provided a rational inspiration for varied readers of scientific die, from Kepler and Galileo to Heisenberg. Another of the platonic divisions of the soul in vegetative, sensitive and rational soul, also is of net Indian origin, or in any case, it admits at least a strictly congruent superposition with *kapha, pitta* and *vata*, and the corresponding functions of vegetative plasticity, irritability and sensitivity. Even the traditional contemplation of the man like body, soul and spirit, keeps a strict correspondence, if not in extension or expression, yes in the most intimate nature of its correlations; being these modes the only thing that matter. We won't allude to the numerous triads of identical nature, which the reader can easily imagine.

13

In principle, any corresponding attempt to define better the *gunas* or the three related *doshas* exhausts in mere epithets and paraphrases. We can use some of them like semantic approaches, granting to the semantics the necessary respect. After all, our investigation can take us to the conclusion that it does not exist a mean to eliminate the "semantic questions" totally.

The three *gunas* also can comfortably be classified in centripetal, centrifugal and orbiting tendencies. As far as the *doshas*, the aspect relatively more material of the primary qualities, *pitta* talks about to the heat and the energy, *kapha* to the plasticity and solidity, *vata* to all the phenomena of circulation from which the form is derived –the purest and isolable aspect of the form whereas independent of the dynamic or plastic qualities. It could be objected that this last one is an entelechy; we will try to see that it is not thus.

Contemplating a tree we can see and touch characteristics such as colour, forms and texture. To say that the intrinsic combination of those external characteristics is the result or the appearance of primary qualities like the growth, condensation and formation could sound unspecific and arbitrary. But if we saw the tree burning, we could distinguish perfectly between that which burns precisely, something that is reduced to ashes, and something that rejects both things and saves in steam and smoke. *The form,* is what it evaporates and vanish, either we say it in the superficial sense or the deepest. Steam and smoke is not simply the result of which is really burning, but very on the contrary is what it flees to burn, as well as, on the other hand, flees momentarily from the gravity. Although the scrutiny of this can take much more far, is sufficient to make see that, in the most violent transformation, while these qualities still maintain some relation to each other, they always conserve unmistakable behaviours. The form is not an abstraction at all, unless we understand by abstraction, the distillation or circulation made by the same tree and its nature.

14

Within this ayurvedic frame of the *doshas*, the clinical procedure par excellence take place: the *nadi vigyan*, the auscultation of the pulse. Those who practice it with unequal fortune are denominated *vaidyas*, sighted persons according to the literal translation. The auscultator successively feels the radial artery of the wrist of the subject with the three middle fingers of the hand, alternating the pressure, in a certain analogous way to the touch of a stringed instrument. The auscultation becomes after a sufficient interval of rest, and in the conditions of the smaller disturbance possible.

In the pulse five elementary properties are recognized: rate, frequency, intensity, amplitude and form. Being a biological oscillator with fluctuations, it is perfectly suitable to the study of its temporary series –by means of the classic harmonic analysis, or the most recent of wavelets, or anyone of the sophisticated tools of the modern analysis.

The limitations of the harmonic analysis or Fourier analysis for systems of irregular profile are well known; although the arterial pulse necessarily has accused regularity enough, it is one of those systems in which the small deviations and peculiarities do not find easy interpretation within this technique. As it is well known, the harmonic analysis decomposes any periodic empirical curve in a sum of sine waves or sinusoids. Given the independence of each one of these sinusoids, which we obtain is a scrutiny of statistical nature on some of the properties of the curve. Another very different thing is to interpret the dependencies and bounds that are relevant in a system like this, for which the harmonic analysis never will contribute explicit proofs.

And, of course, spectrums of the pulse and of the electrocardiogram particularly have been made in innumerable amounts since Mobitz, van der Pol and van der Mark gave the first steps in this area.

15

Of the five elementary properties that the auscultator distinguishes of natural form with its own fingers, the four first –rate, frequency, intensity and amplitude- admit a relatively acceptable interpretation in terms of harmonic analysis. The frequency is the inverse of the period, or the number of beats or cycles in a sufficient time interval, we say a minute. The rate is the measurement of the regularity or irregularity of the cycles throughout the interval. The intensity is the peak altitude reached on the tips of the wave of the pulse. Finally, the amplitude is the total difference between the maximums and minimums of the wave. In addition to these four more analyzable elements, we have *the form* of the pulse, the true and evasive quintessence that surrounds and penetrates the values of the other four properties.

In the most trivial sense, that is to say, according to the representation of the graph, it is clear that the form involves the other components, since the form is the whole curve and it does not have anything else. Nevertheless, for the auscultator other shades exist in addition, since it modulates the pressure of his fingers in three different points. In such sense, and even without contradicting the properties of the curve in the graph, it extracts some additional information.

Since the verbal characterization of this form of the pulse assumes poetic or metaphoric characters, many people tend to think that it is here where we enter a qualitative dominion and we move away from the quantifiable one. For example, it is spoken of a typical "swan pulse" for the marked predominance of *kapha*, of a "frog pulse" for *pitta*, or a zigzagging or "serpent pulse" for *vata*. But, naturally, these indications left by the classic texts as a mere indication, within a dominion of continuous shades are too simple. Therefore, we better not deceive by all that terminology: we are treating about a quantifiable and perfectly analyzable phenomenon, and it is precisely by its fluidity, by its continuity, that is more treatable in analytical terms than for a not very well trained judgement.

16

It is completely certain that the young and not so young medical practitioners of these traditional medicines, whether the Ayurvedic, the Chinese or the Unani medicine, complain the darkness of the classic texts and the great difficulty that entails to acquire a minimum of security in the judgment for this type of diagnosis. In other words, the auscultation by the pulse is in clear regression, because it is not considered practical enough. I am afraid that this has been always the case, and that at any time have been very little doctors able to master this art. But here what it is at issue is not the technical difficulty of a learning, but the fidelity of the pulse like signal of a greater system and its possible relevance in other spheres of the analysis and even dynamics. If we understood in a legitimate analytical form all the information that contains the pulse, and the wider perspective than can offer us, the practice of these same reticent doctors would be one of the first areas in benefiting from it. But we think that the pulse has more enough to teach to us. The pulse is the true pendulum that we are looking for.

17

Like any purely empirical science, the diagnosis by means of the pulse has peculiarities that resist to being transferred to a quantifiable and exact frame. We will mention some of them in passing.

The auscultator obtains pressures and curves of the wave with a different form for the different points in which he locates his fingers. Nevertheless, the modern doctors have stated, introducing a catheter, that the pressure is the same in the three alluded to points. This has been wanted even to show that this is a fraud; at least for us, this class of fast disqualifications is one of the main ingredients of bad science. Because it is evident that to feel a signal from the outside has little to do with introducing surgical soundings, and, at least, the possibility would be due to grant to the ancient doctor of obtaining as much data as possible, mainly if he has the least conceivable means. The differences of the form of the wave are due, of course, to the greater proximity to the bone or the skin; that is to say, it is a difference that we moderns would consider phenomenological, although thus we are not doing full justice to the subject. Because, in effect, these three points are a kind of average to be able to perceive the superficial, deep and intermediate aspects that are conjugated so well with the same nature of the *tridosha*; without forgetting that in these medicines, and the same nature of the body, a natural differentiation between the bones, the flesh and the skin exists, of very similar order to which at embryologic level we recognize between endoderm, mesoderm and ectoderm. So that, not without humour, we could say that what does the *vaidya* or its colleague of other traditional medicines, is very similar to empirically solve a system of partial derivative equations, of those in which we observed the evolution of a variable while we maintain the other ones constant. Known it is that the partial derivative equations appeared first in mathematics in the prehistory of the harmonic analysis with the approach of D'Alembert to the problem of the vibrant cord –and that the measurement of reference of Galileo for his first observations of the pendulum was his own pulse.

On the other hand, it is certain enough that the different traditions that have made use of the pulse diagnosis have different categories, but this mainly affects the terminological framework, more than to the same concepts, that are remarkably homogenous. The same classifications of typical pathological pulses are even repeated abundantly, although such classifications don't pretend to be another thing that empirical approaches and estimations. For example, the ayurvedic medicine speech in terms of the *tridosha*, and the Chinese of *yin* and *yang*, deficiency and excess: but both are speaking clearly of a balance. Otherwise, we will be completely mistaken if we think that the Chinese system is dualist, or even binary: the excess and the deficiency *presuppose* the mean or included middle –the vacum, which prevails on both. It could not be expected less from a culture that protects and values the main thing with the ellipsis. And nevertheless how many western scholars have not seen in the Chinese vision of the polarity anything else than the more refined form of the binary notation.

During a long time, the mechanical sphygmographs or pulsographs have not been able to catch all the subtleties of the form of the pulse. If, for example, we use a Doppler flux-meter, which we will obtain is an average of the speed of the flow of the blood in all the vessel, that apart from that respects the Bernouilli law and has a parabolic profile, with greater speed in the centre of the vessel and minor in its wall, and the contrary for the pressure. This way, hardly we can obtain in the graph some notion of what it can be a "hollow" pulse, or one "sliding like a ball in a porcelain cup", or "rough like a worm nibbling a mulberry leaf". Obviously, the fingertips that feels "sees" here much more than what the eye can observe in averaged and impoverished graphs, although in fact, it is simply sensitivity and possibilities of modulation. Of course, now we can have multiple classes of sensors, including high fidelity microphones and adjustable pressure sensors.

It is possible then to say that, until recently time, there has been no experimental possibility to gather mechanically the subtle range of information that the physician obtain simply with its fingers. Now that has stopped being problem; the problem is that we are incapable to analyze quantitatively these data without grossly distorting the original coordinates that served in his judgment to the doctor. As we indicated, there have been made an infinity of spectral analyses of the pulse –and it is to notice that we say of the pulse, not only of electrocardiograms -, but, For what serves to say that below a value of 100 arbitrary units the patient show insufficiency, and that over that threshold it shows an excess or plethora of which it is wanted? Even if it would be certain, we have lost by the way all the logic that attended the doctor, and we have turned it into inexplicable numbers. And precisely what we look for it is to keep awake the amplitude and importance of that

logic and those coordinates.

Quite exasperating questions exist soon, like the fact that hardly somebody is put in agreement to detach and to locate the different parts of the information obtained. Someone take the pulse only in one the wrists, others in both wrists; others still assure that the meaning of both hands is reversed depending on the gender. Neither in the Chinese medicine there is agreement with respect to the relation of the meridians with the points of the wrist, etcetera. It is not to surprise, therefore, that what it seemed in the beginning a relatively simple question becomes in fact a dense forest. This is what has motivated so many hurried and coarse attempts of quantification, with the rather vain hope to turn this type of diagnosis something more objective. One assumes, yet, that it is the knowledge and not the crude numbers what turn something objective. And nevertheless, it remains a doubtless fact: that we will not find another signal more faithful and immediate, neither more globally representative of the immense set of factors that are united to form that that we call life, that the pulse.

18

The problem, seems to be, is that here we lose ourselves in the forest of the semiology. The present cardiology makes every day new advances precisely in as much it is able to avoid these semiotic questions, to turn them functional and anatomical details. Once again, the reductionist spirit seems to prevail. But this has much of illusion, because between what is "functional" and what is "anatomical" an enormous abyss remains. Aside from the fact that the *vaidya* persecutes a much more general object than the anatomical or functional state of the heart: the state of health of the whole organism is up to him as well as the details more relevant than concur in it, and being the state of the heart only one of them.

And speaking of semiology, and leaving apart the fact that the human kind never left to interpret signs, it can be said that the pulse diagnosis, and in particular within the Indian scheme, it is the first consistent semiology as much from the rational point of view, as from the experimental one; although it seems that there would be numerous arguments to doubt it after which we have said. Yet, if we observed the modern attempts in this field –the semiotic triad of Peirce, for example, that so much has to do with the general scheme of the *triguna* -, we will verify that still the old models keep advantage, specially at the time of the experimental confrontation with the brute facts.

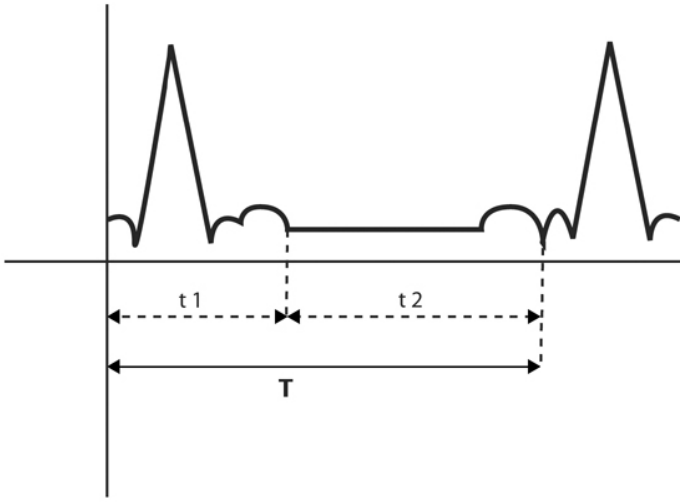
In addition to this, and with regard to the pretended opposition between the reductionism and the global interpretation of the phenomena starting from its performances, it is worth the trouble to remember that it is this last what all the men of science and philosophers worthy of such name, from Newton and Kant, have denominated with the name of *analysis*, and not on the contrary, as sometimes the custom and the forgetfulness incline to believe to us. Then to explain the behaviour of a system from its basic components, is what is denominated *synthesis* or composition; composition that most of the times is so far from our reach that only takes place in our imagination. Nevertheless, the imagination is the less suitable that can exist to follow the behaviour of any moderately complex system, and we don't say already, something with the complexity of an organism. One of those global analytical interpretations is, precisely, the theory of the gravity of Newton, that to date, nobody has managed "to compose" nor "to synthesize". The interpretation of the harmonic analysis locates to us in that same meaning of the term analysis, now with arbitrary degrees of complexity. Before we said how badly treats the physics with the causal level of the phenomena, and the basic reason for which this cannot have place in it. Hume's critic to the causality concept is worth for a representation like the one of the classic Newtonian physics; but this is only a frame of representations, and our direct intuition of the change is not lent so easily to the representation. More on the contrary, may be eludes it perpetually.

The *Triguna* of the Samkhya is a system of coordinates for the change, the simplest, more direct and intuitive possible. But precisely what we understand by system of coordinates is the clearest of the representations, and here we are in the antipodes of the representation. We must always have in mind this fundamental difficulty.

19

The three *doshas* or implied reactive humours in the movements of the pulse correspond in addition with three components or precise mechanical moments: in the most general sense, *pitta* corresponds with the contractile impulse of the heart, *vata* with the state of the walls of the vessel and its conduction of the contractile wave, and *kapha* with the fluidity or viscosity of the blood –we spoke, naturally, of an elementary correspondence, not of a reduction from one terms to the others. Even like independent terms of a problem of fluid mechanics, these three factors already are sufficient to originate a non-linear system without stable values in the solutions; but in the organic dominion, and of course in the one of the Samkhya, there is an intrinsic dependency and feedback between them.

In the pulse there is no continuous transition between systole and diastole, but that, even in spite of the damping of the impacts that supposes the flow, the pauses continues being appraised, so that the scheme is perceived like contraction-pause-expansion-pause. That is to say, that for many effects, in addition to the continuous signal of the wave, we have a genuinely discreet system, as it is derived from the doubtless fact that the nervous signals that activate and deactivate muscular fibbers of the heart are antagonistic and they are excluded and mutually blocked. As we see soon, this does not lack importance, since it is in the base of the only concept of oscillator or circuit with an own content: that in which the circulation exists for the only reason that two conditions cannot be satisfied simultaneously.



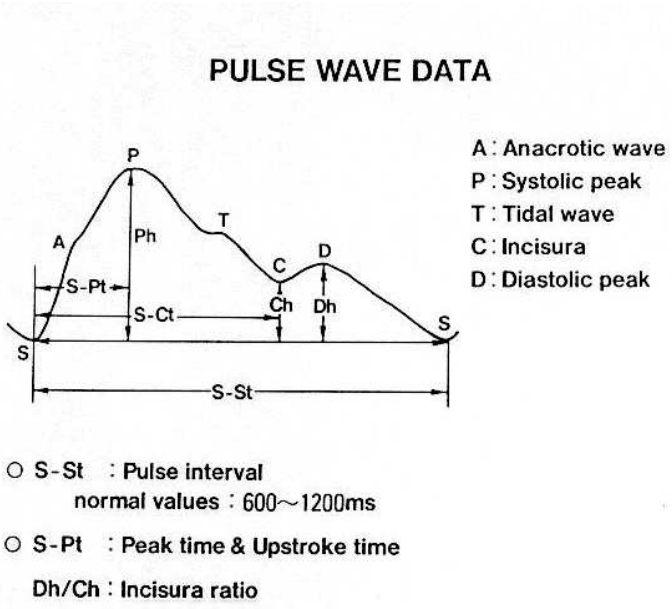


fig 1

Of course, and unlike the pure scheme of the movement in the classic mechanics, the living beings and the organisms –otherwise the same than the elementary particles- have characteristic times of reaction, which cannot be avoided. This is evident from the more elementary empirical point of view, but it tends to be diluted and to lose its specific importance as we translate it to habitual analytical descriptions.

Perhaps the more immediate form to warn ourselves of the use of the third principle, the equality of action and reaction, is shooting a gun and verifying in our body the backward movement. Naturally, the butt does not strike to us with the same departure speed of the bullet, but, approximately, with that one which it is quotient of the mass of the bullet with respect to the one of rifle. In addition, and if we wanted to enter details, always we will find that there have been losses by gases of the explosion. If we only know the exit speed of the projectile, or the one of the backward movement, we needed to know what has happened in the middle to precise the balance; and knowing of the action and reaction, we even needed to know the mean or apparatus to be able to precise the way in that the loss takes place. Detailing, we would also verify that the reaction is not simultaneous and immediate, but always includes a time, although for many effects it seems to us negligible. I hope that so elementary example will be pardoned to me; but often it happens that, when we studied the organism as a black box with some or many output data –whether they are anatomical or analytical- we return to turn the same data another black box to study itself, losing interest of the inputs and outputs themselves. That is to say, everything becomes in the middle, unlike the example of the gun, and we forgot what it has entered and left in both directions, which in the case of the organism surely includes something more than the diet and the depositions.

Yes, all this round about was only to say that we can appreciate the mean and a sensitivity between action and reaction in the global conditions of the organism with no need to contradict the indispensable laws of the mechanics. How it could be otherwise? Nevertheless, Can we grasp this in some way simultaneously elegant and direct? This already seems another question.

It could also be added that the human body, like any organism, is essentially an open system. And, of course, for the Samkhya any object that we like to consider is an open system; reason why the *gunas* emerges like the efficient cause –and not like mere formal laws- of open systems in interchange with the environment, in the same way that we applied the three laws of the movement to ideally closed systems. Yet, to speak about the organism as an open system does not imply to reduce it immediately to a dissipative system, like opposed to a conservative one. Since an organism has boundaries and stability conditions whose reach we only know in a small degree, although they are manifested enough in its effects. It is not small task to define these dissipative and conservatives aspects in the living beings; but the predominant strategy to approach the problem at the present, through the complexity and the organization –with the genetics and the biochemistry as it base- hardly can get to fulfil this relation, if we consider the enormous epistemological gap that we noticed between analytical elements, component of a synthesis, (they themselves composed always) and causes.

21

As it is known, in fluid dynamics we can replace the three Newton's laws by variational principles, transforming them into the potential, kinetic and inner energy of the system. While we only work with the kinetic and the potential energy, it is generally easy to know the magnitudes that are conserved; but when we introduce the internal energy (P + K+ I), that can be expressed like viscosity of the fluid, pressure, or perturbations, it is much more difficult to know what is exactly what it is conserved. Simply, we have to presume the conservation principles. This is the great difference between the hydrodynamics and the dynamics of punctual particles, in which the conserved magnitudes remains in a explicit form. The pulse, that is a system periodically perturbed by the beat of the heart – a forced oscillator with power supply-, admits this type of description; only that the feed-back of the factors makes it still more complex.

The three *gunas* and the three *doshas* can be put in a correct correspondence with the kinetic, potential and internal energy of a hydrodynamic system, which in fact, seems to us much more natural than the punctual dynamics or mechanics in strict sense. Hamiltonian dynamics, in addition, supposes the incompressibility of the space of the fluid. This is a fundamental point that it cannot be applied literally to a system like the vascular one, where there are expansion and contraction of the vessels or arteries, and not only by virtue of its elasticity, but also by muscular fibbers of the walls that act to nervous impulses following the contractile rate of the heart. It is to assume that also the same heart and its rate of impulses has to be sensible to the answers of the vascular circuit, and in fact we know that the global feedback of the system takes place at several levels, nervous, as much chemical, not being the sensitivity to the fluidity or viscosity of the blood the minor of these elements. So that the circuit and its answer are a model example of biological self-regulation, whose study has grow unceasingly from the pioneering works of Cannon and Wiener. All this allows us to raise old and interesting questions to us in a new way. Truly, we know well enough and with many details *the explicit* physiological mediators, such as nervous, hormonal, and biochemical in general. These without a doubt play a fundamental and irreplaceable role in all this self-regulation process –they would not be there if they had no utility. What we don't know is how they have gotten to be there and what it has guided its formation. Doing without answers of type "genetic programming", that today we know perfectly that it constitutes only one part of the subject, and not the greater one, and that it has to do much less with the "programming" that with sensitivity and the modulation by the environment, happens another much more stimulating approach to us. This is based on the compressibility of the whole circuit and anyone of its parts, compressibility that can and must admit very variable degrees, although, of course, they must be measurable.

Of course, in such case it is not a Hamiltonian or classic system what we have; we not only contemplate the existence of friction, but of other non explicit variables in indefinite number. We maintain the analogy and the connection with classic systems to only have a reference on the conservative aspects of the system. As everybody knows, pure or ideal classic systems do not exist, which does not prevent its routine application. Nevertheless, although we are speaking of systems really far away from the closed and

conservative models, we are interested particularly in the intertwining of two main features. We can call to this "semi-classical systems" provisionally and only for comfort, although by such terms can be understood an infinity of different things.

Speaking of compressibility in semi-classical systems, we entered completely which today it is known like nonlinear dynamics, one of whose main signatures, although not the only one, is the determinist chaos. This one appears in principle in perfectly differentiable systems and with initial conditions of arbitrary precision, and therefore way different from the model of the pulse. In fact, it can be said that the determinist chaos is an almost purely mathematical discovery, although their relations with dynamics have been explicit from the first moment, backing down in the time to Poincaré and his studies of the celestial mechanics and the three bodies problem. In the unitary evolution of the phase space –the Hamiltonian- of innumerable systems, next to the instability of the solutions in the equations, appears "basins" or "attractors": the dynamic evolution doesn't disperse uniformly through all the space available, but it is compressed with a certain preference in a part of the volume. This already is a clear example of compressibility, unless it is not clear absolutely what is what causes that the system is compressed and why. That's the reason of the controversial statute of this type of findings. Different measures can be taken from the instability and the degree of compression of the system – Lyapunov exponents, fractal dimension, entropy indices, and a long list of others-, without on the other hand there is never a clear dividing border between the random or stochastic component and the determinist component of the system; except for precisions *ad hoc* of the particular model. This way, the present "revolution" of nonlinear dynamics is an unfinished revolution, or so to speak, "half a revolution": it has acquired the statute of the omnipresence without being able to contribute no type of clear conclusions. The so-called determinist chaos more seems the beginning of one long exploration in the immense territory of the relations between chance and necessity that a theory defined for anything. Nevertheless, when it reached the threshold of the spreading and of the public distortion already time ago it was a suspended exploration, at least about conclusive results. And thus it takes growing more of a quarter of century, with no particular direction. The same theoretical or fundamental physics, which many blame of stagnation, has much more specific and clear challenges and urgencies; at least, according to the present order of the appearances.

22

People say that after the fever, the calm and the reason returns, and life can continue progressing with a more normal rate. The present state of things on nonlinear dynamics and the theory of the complexity – different areas but multiply associated- are so that significant advances in a great number of points could be expected, but hardly a transcendental upset. The experts move in the specific dominion of the intricate and difficult, of the concrete applications, where rather are possible to wait for technical refinements more than true conceptual jumps. Everything flows and is moved, nevertheless. Meanwhile, and waiting for results of more weight, it is totally certain that nonlinear dynamics has changed substantially the way we see the world. The determinism itself has done that we believe less and less in the determinism like explanation of the phenomena. Like this change is substantial, but still non-fundamental, as if the spearhead of our conviction in the causal explanation of the phenomena had been notched, or is even dissolved in the air, while the inertia of our background convictions continues maintaining the same direction.

23

We have spoken previously of a partially compressible circuit in all its points: the circulatory system itself, of which the pulse is the more explicit dynamic signal. Of course, if the circuit were totally

compressible, its flow in a torus or ring structure would be reducible to the simplest of the forms. Nothing of that happens, on the contrary: there are very significant reductions of the space of flow, but of almost impenetrable nature. In an evident way, to look for the suitable compressible space to the behaviour of the system it is just like to look for how to make it comprehensible. Both terms become therefore equivalent.

Ian Stewart has opportunely observed that it not exist any law of conservation of the complexity. Of course, now it is very well known that very simple systems can complicate themselves, just giving the sufficient time to them. That was precisely the lesson of the determinist chaos. And if really there is no law of conservation of the complexity, we have reasons to think that this is applicable in the opposite sense, that is to say, that very complex behaviours are derived from very simple laws. In fact, this is equally certain, and in the more trivial sense, for many of the sources of determinist chaos, systems governed by differential equations as familiar as those of the celestial mechanics. But if what we are speaking of are *new laws*, with a different descriptive and explanatory rank, still none has been discovered that could make the complexity more compressible and comprehensible. For example, the duplication of period discovered by Feigenbaum generates complexity, but it does not reduce it, except in a minimum thread of the scheme of evolution in a particular transition of state.

So that the general situation continues being noticeably unidirectional, with a base of fundamental and determinist physical equations that generate more and more complexity according to they are studied, without barely any development in the opposite sense, the one of the true compressibility.

24

The presence of determinist chaos in the activity of the heart has been and is a controversial subject also, and this is natural, if we consider that the borders are by definition blurred in this dominion. What is doubtless is that there are important irregularities in its temporary series, and that these often show fractal or quasi-fractal structures, that is to say, self-similar structure with correlation on different scales and in the long term in general. Another thing is to judge and to interpret the role that such irregularities play, if they have some specific importance or it is simple randomness. Almost all these studies talk about *the electrical* activity of the heart. The pulse and its temporary profile have been studied much less from this perspective.

In general, the pulse is a lowly nonlinear system; that is to say, it is not associated directly neither with the chaos nor with the turbulence. In fact, when the auscultation perceives indirectly turbulences through whistles or murmurs, they are a clear signal of cardiovascular pathologies; in any case, such turbulences only seem to take place in the greater vessels, and not in small vessels like the radial artery. On the other hand, the flow of the blood is not turbulent in general, but neither really laminar, which is not another thing than idealization. Now specialists even continues studying actively if the best model of this flow will not be the one of helical or spiral trajectories, perhaps more economic or optimal. The low nonlinearity of the pulse is resumed in the fact that we cannot accurately calculate the phase angle of the beat and its wave, not even in few cycles, although nevertheless the global regularity of the signal is very great, without the enormous fluctuations in the values that can take place in differential systems infinitely simpler, but chaotic. That is to say, it maintains a great global stability; otherwise, we would not be alive. Precisely by this, it has been wanted to associate the cardiac failure with a transition to the chaos, although the relation is very far from being clear.

25

It is possible to ask to what extent our information on the dynamics of the pulse becomes richer when

we try to catch the specific *form* as it catches the *vaidya* with his fingertips, in comparison with the schematic and averaged form of the mechanical registry of the conventional esphygmograph.

I would wish that it was not necessary to say that this specific *form* of the pulse in the palpation nothing has of mystic or mysterious, except for the differences that always will exist between the sensation and the direct perception and any analytical representation in graph form, no matter how exhaustive. What differentiates this *form* from the general and averaged profile of the wave is, from the perceptive point of view, that precise quality that cause that a pulse seems "full", "empty", "rough", "hollow", "hard", "tense", etcetera. This already is a perceptive synthesis of factors of doubtless mechanical character, but they do not have why to be well specified in the curve of a graph: the impulse until certain point yes, but not the cushioning of the fluid, the state of the arterial wall, and less the relations that can have between these factors. And all this already supposes a precious synthesis of information, by more confused than it can seem. Not even it is high-priority to detach it, but simply to catch it and to register it as faithfully as can. Certainly a part of these qualitative or perceptive aspects can even be inferred of indirect form from "the flat" profile of the conventional registry. As we already said before, now we have adjustable pressure sensors and other types that allow us to catch this general feature. And of course that we can transfer this information extended to the representations of graphs, mainly as thickness or refinement of the outline of the wave, including its variability throughout the cycle.

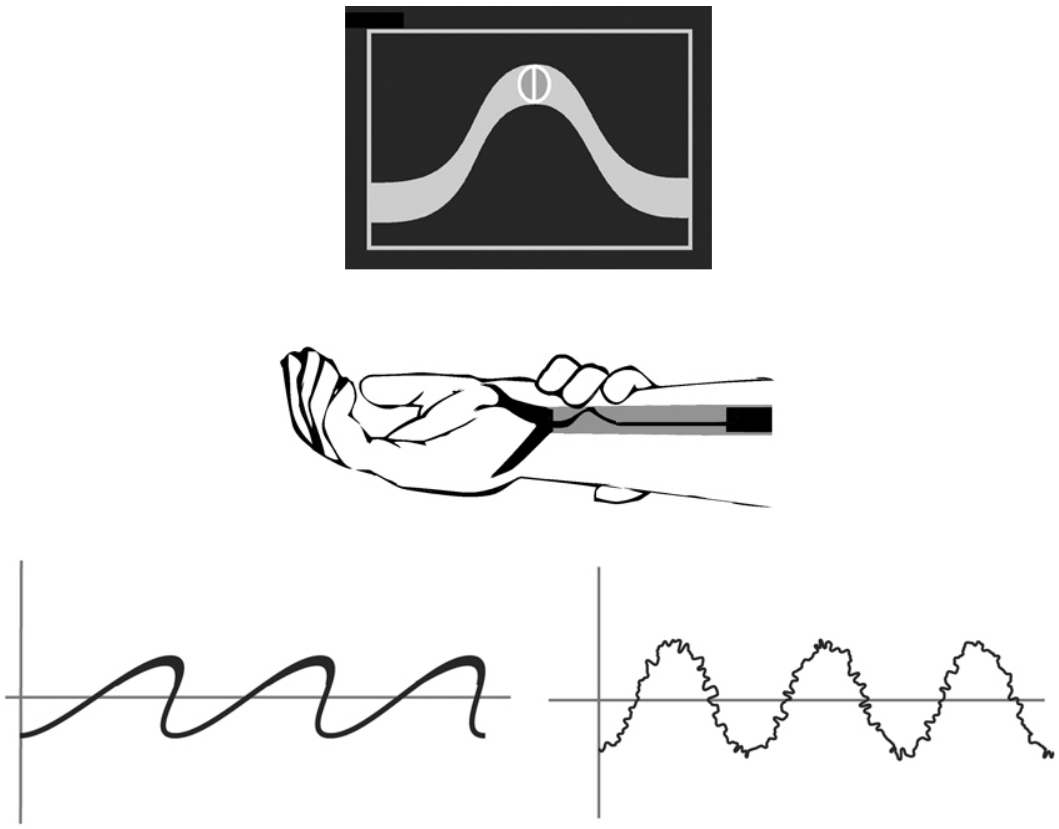


Fig 2

We can see all the phase of systolic ascent of the wave like the kinetic energy, and the one of reduction or diastole like caused by the potential energy. The whole cycle is already intrinsically irregular by functional questions, like the attack of the cardiac impact and its later diffusion; but also the spacing between

the beats, and their corresponding duration is irregular. In addition, as it can be seen in figure 1, the diastolic part has its own tip of ascent, reason why the wave is far from being simple. In any case, if the ascent and reduction of the wave are both the more elementary components, all the others will be under the correspondence of the third component, the internal energy, that from the point of view of *vaidya* is not another thing that *vata* or sensitivity between action and reaction. "All the others" are not but the irregularity of the temporary series, either we consider it in the way of the "flat" graph, or with the more detailed graph that gives us the quality of the outline or forms of the pulse. That irregularity includes as much the whole interval as each one of the periods or cycles. Evidently, the three factors always are conjugated, and we can measure as much the line or outline length, as the area included by the routine methods of numerical integration, which, in a computer, is reduced to count pixels. Would it give this conjugated measurement something at least similar to the brief estimation of the quantitative proportion and predominance us that the *vaidya* establishes when he takes the pulse to a person? Surely yes, because there is no space neither place for other considerations. Nevertheless, it remains certain that the physician does not have in mind very fine quantitative estimations, which do not need if he knows to grasp the shades, and these are diluted of intuitive form in another type of considerations. But these shades are not but those variations in the continuous dominion that to the graphs and the calculus give us and that the physician would not know to quantify verbally. Therefore, a real coincidence between the quantitative and qualitative aspects exists, although it is only expressed like a mere parallelism. That is to say, we have deceived the supposed difference between both aspects, maintaining the proper categories of the *vaidya* and without weakening them. It could not be otherwise, being these genuinely *analytical* categories since the beginning. Yet, in the verbal level this only can be a correspondence, by the same fact that in the verbal description the quality necessarily prevails on the quantification. In fact, the auscultation of the *vaidya*, its listening, is an exercise of sensitivity different as much from the verbal considerations as of the quantitative ones, even being able to include to both.

26

In the first approaches, we identified the variable thickness of the form of the pulse with the sensitivity between the action and reaction, or the kinetic and the potential energy, introducing something like a pseudo-derivative. A balance with sensitivity and a time of reaction allowed us to give a kind of symbol of the implied factors.

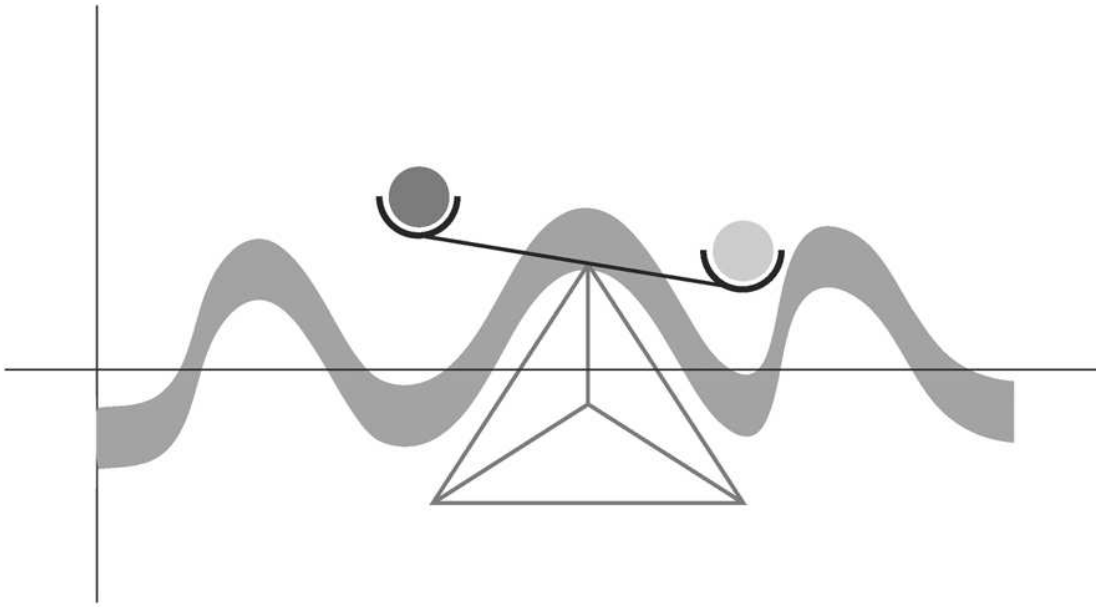


Fig 3

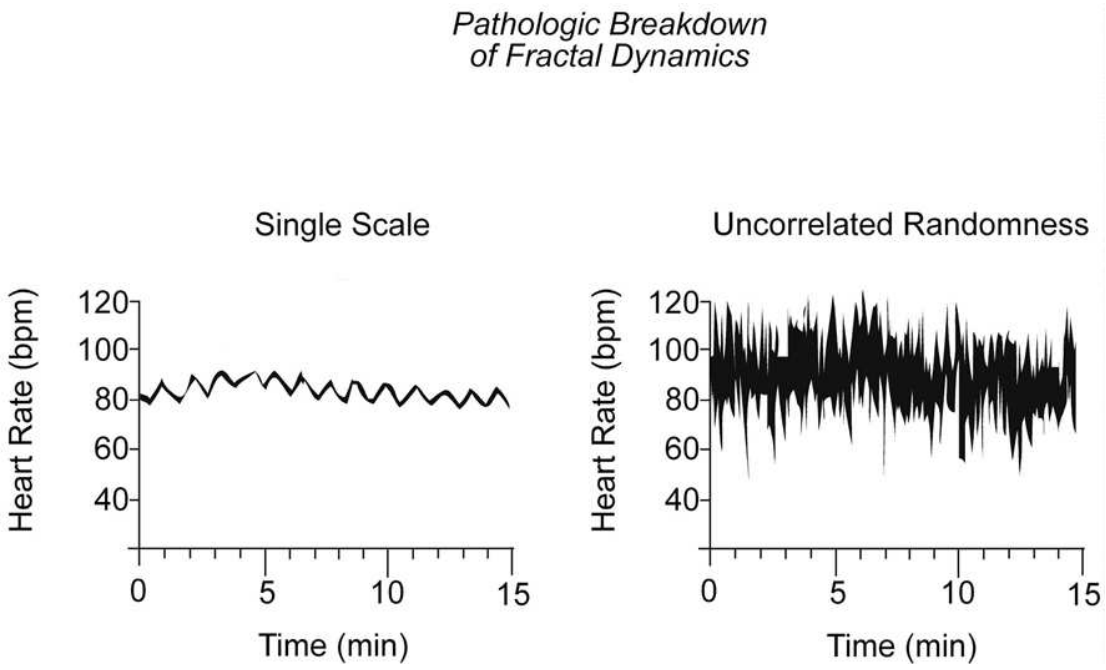
But it was clear that this only could be a symbol to indicate some kind of lost information, and no way a realistic model, and even less mathematical. Although this analogy was well clumsy and even picturesque from the mathematical point, it is worth the trouble to remember that it is not a simple subject to pass to graphical and analytical representations notions that apart from to seem qualitative, are conceived beyond the representation and even, it could be said, made specifically to deceive the representation.

What we tried to show with that symbol was the necessity to contemplate the three principles simultaneously, and not only two. In any case, the global sensitivity of the system of the pulse, the third *dosha* which we associated with the internal energy, cannot be caught immediately in any point of the wave –it is not punctual, neither has derivative nor pseudo-derivative -, even though the pressure, that is what the fingertip feels, can be conceived as form of internal energy by volume unit, if we follow the classical Bernouilli equation. But, even doing without other essential factors like the cushioning, fluidity, or the state of the vessel, that can concur in this synthetic representation of which truly happens, still we would be ignoring a fact that has a greater importance: that the balance between the three factors cannot be of instantaneous nature, at least within the factors that can be represented within this so limited frame. That is to say, that within this unilateral and incomplete representation, the balance has to necessarily show like something in the long term and non local, scattered on different scales within an interval. That is to say, there is no sufficient space so that it can be made in every moment. There is no space of time.

In effect, already before we said that a perfectly compressible circuit would allow its corresponding and inevitable elementary reduction within the simplectic space. That the circuit was compressible would be equivalent, precisely, to that we could find it completely in any point. And this would make the time unnecessary as well, that would perfectly become monotonous and incapable to introduce alteration or novelty. Like the ideal pendulum of the mechanics. The time would not have to make balance between anything, neither the operation to make that balance could create or consume time nor development at all. "To create or to consume", two faces of a same problem.

In the study of electrocardiograms the presence of these long term correlations has been demonstrated, on different scales. Also there is categorical evidence of which these correlations are richer and more detailed in a healthy subject, and minors in as much the pathologies get worse. That is to say, the most irregular and broken patterns are healthier than monotonous. This comes to be basically in agreement with the idea and perception of the Samkhya of which a greater sensitivity makes more stability possible, and on the contrary.

Nevertheless, these same studies have not been able to go further from this. Not even is suspected why reason the cardiac irregularities would have to be more healthful than monotony, what cannot be surprise with the idea of time which we maintain. At the most, somebody suspect that it could have some delicate game of balance behind these signals –what it is not suspected is that the own signals are already an exhibition of that balance. To know it is not very useful if we don't know the ground on which that balance takes place.



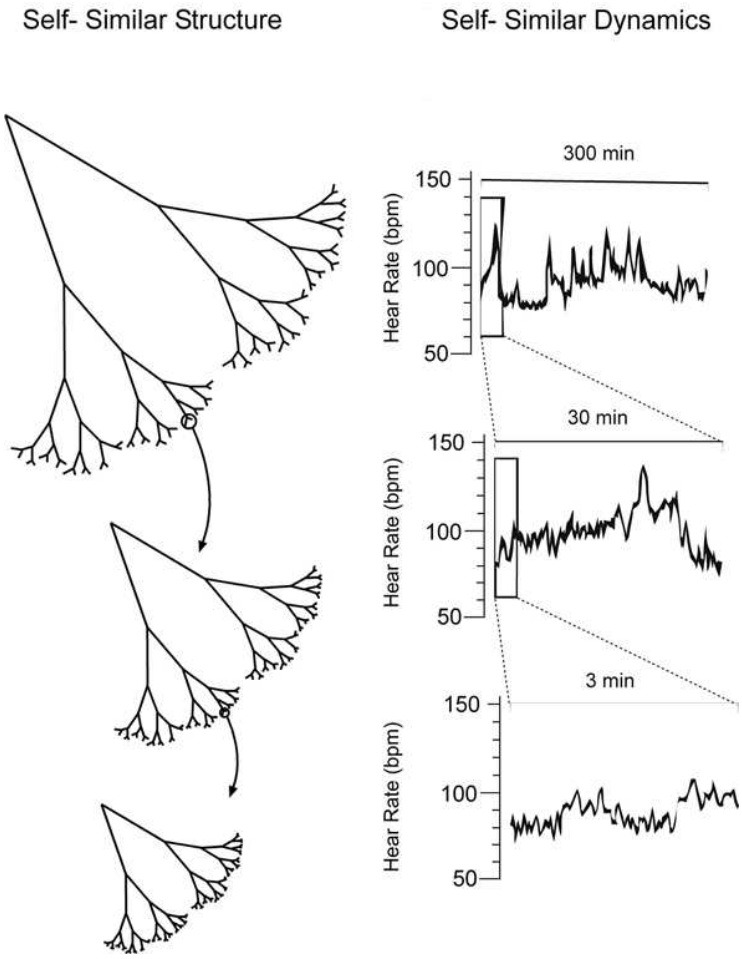


Fig.4

28

If we think from the perspective of the continuous variation, it seems trivially certain that it cannot be two exactly equal pulses. What it is already much more extraordinary, and precisely within the continuous dominion, is the fact that in any pulse, and at any time, can be distinguished the innate and the acquired factors with sufficient clearness. This is a differential luxury of the nature that would be absurd to waste; so much it is what must teach to us. Since even from the point of view of the genetics, to establish the relation between the internal and the environmental activation of the genes remains like a puzzle very far from being understood, and we do not say already of being solved. It seems to lack a minimum reference for this problem, so fundamental in theoretical biology, the evolution and development.

The *vaidya* distinguishes between *prakriti* and *vikriti*, biological and the biographical features, the original or innate constitution of the individual and its tendencies acquired throughout the life. By definition, any later state in the health of the subject is dependent and referred to the constitutional tendencies; so that the produced habits or alterations meanwhile are, on the one hand, assimilations of the eventualities to an original conformation, and, on the other hand, that same complexion has already its slopes of reaction before the accidental conditions or *vikriti*. If *prakriti* and *vikriti* come to be like the substance and accidents for a given pulse, not for that reason it is necessary to forget that in the long run those accidents and way of life may

become the most decisive for the destruction of the balance that represents the health. But not in vain it is spoken of way of life, then. In an essential way, the form only is modified by its own form to wind itself in the time, and that thread has to be perceived by the *vaidya* with the right sensitivity.

Anyway we consider it, it does not stop being an extraordinary wonder the fact of that individual persistence of the form of the pulse throughout all a life, if we think about the immense variety of circumstances that can surround and alter it, and about the very slightness that its signal represents. If we think about that this little thread of time is going to maintain something own in the most adverse circumstances, beyond the successive losses of identity of the memory, and that not even a violent death can rob the right to it to disappear according to its own and intimate law.

29

This distinction of the tendency within a tendency is so fundamental for our study as it was it the distinction between speed and acceleration for the birth of dynamics through the concept of force. A model of fluid dynamics –say a circuit of pipes with pressured water- cannot establish this type of differences because the components are not connected from the origin, and all the differential characteristics that we could measure later depend on the arbitrary variation of parameters. A primary, original reference does not exist. The dependency or sensitivity of the chaotic systems with respect to the initial data is in the antipodes of this other type of "original conditions": first they are highly unstable before small changes, whereas the very small changes in the proportion of *doshas* have an equally small effect. But already we said that the three *doshas*, their predominance and proportion, must be conceived as reactive slopes or gradients: like tendencies forming *a potential*. This potential, their boundaries, does not have sufficient freedom to evolve anyway, and a too abrupt change would lead necessarily to the death. Therefore, it would be more than desirable to know the boundary conditions of that potential, or in other words, its economy.

30

The definition of a potential of this type seems extremely difficult. We not only spoke of an open system, in which their components already are related to the environment from the beginning, not only in fact, but in its same sense and meaning. *Vata* is not only a sensitivity between the action and reaction, it is also and at the same time sensitivity to the environment. Therefore, it is simultaneously internal and external sensitivity, and to distinguish both seems more a task proper of another point of view than this one. *Rajas* and *Tamas*, the effective force and inertia, seem more internal to the system, but they always are mediated through *vata*, the sentience or sensitivity.

This, that seems a great obstacle, is also the main virtue of a system or organization thus conceived. Had not this ambivalence, the vision of the *Ayurveda* or *the Samkhya* would not offer anything truly new to the conventional mechanistic vision, which by definition considers closed systems, and altered by other equally mechanical perturbations.

Let us return again to the nature of the change and fluctuations of the *gunas* or its associated *doshas*. We have already said that, for the Samkhya, the *gunas* are anywhere as much inside as outside and that we can observe them if we learn to analyze what we see; that there is not any other knowable thing in last instance.

The three *gunas*, being in balance, are unknowable and they are reabsorbed in the consciousness without qualities. If the existence of the *gunas* is based on its inequality, it cannot be on the other hand modification or fluctuation without the dominion of one of the *gunas* on the other two, which makes possible that the modification is knowable like moment itself. That dominion has the form of a modification of the weight or value of one of the *gunas* that reverts on the weight or value of the other two. This admits and

demands characteristic sequences that, beyond the abstraction, constitute the only form of causality which we can know. That's to say, there is not another, and any other apparent form of causality will be revealed like mere representation. The representation of the causality, therefore, moves away to us of the only knowable and intuitive causality. These three modalities are only applicable to the real cases, not to imaginary entities without comparison terms; we spoke from the beginning of conditional entities, not ideal or closed ones.

One *guna* or modality cannot exist separately, so that a state dominated by *Sattwa*, we take for example, already includes the presence and subordination of the other two, as much for the most stable cases like for the fluctuations themselves. The same is valid for the other *gunas*. Patanjali distinguishes between diversified states, undivided or monadic, only indicative, and non-indicative states of the *gunas*. The same empirical or mutable ego is an undivided and indivisible case in practice, no matter how hard so many intellectuals insist presently on its theoretical dissolution; the pure I sense, the existence like mere attention, is an only indicative state, *Linga-Matra*, reason why the non-indicative state, *Alinga*, properly is non-manifested, rather than nonexistent, if we want to fit expressions that rarely we use with property. This is, to the state of balance of *gunas*, it is considered a metaphysical term or not (in which metaphysics all the well-known reversible physics would enter), it is not attributable neither the existence nor the not-existence, and the only thing that is possible to say is that it does not generate indications nor references. The fundamental states or sections of the *gunas*, in sections or groups of five and six, have a great importance if we want to deepen in this dominion, although now we will not stop in it.

31

If the balance of the three *gunas* constitutes its non-manifested state, it is because there is no place in them for the dissolution, growth or decrease, since they lack material cause. If we follow enough the growth or manifest decrease of the *gunas* in an entity or system it is inevitable to verify how values that seem to be diluted can emerge from their latency, and vice versa. But a value cannot sink in the latency, in the relatively non-manifested, without passing through the modality of the Latency or Retention, that is to say, *Tamas*, in the same way that cannot emerge without action or *Rajas*, nor acquiring certain balance without *Sattwa*. It must have an eloquent continuity between the content of its values and the form they are manifested.

32

Even accepting that the *gunas* themselves neither increase nor diminish, any action or predominance of one on the others in an empirical temporary entity must be seen in such terms for the understanding of the sequences and its evolution. A sequence begins necessarily in the *guna* that it is dominant at the moment. This already produces a redundancy that can be detached indifferently in several ways, since what is increase in one always is correlative diminution in another one. We can detach a simplified scheme in conditional form:

1 If *Sattwa* or the sensitivity "increases", this entails a correlative diminution of the activity of *Rajas*, and never its increase (This does not seem evident and there is all kind of experiences that at first sight seems to contradict it). It can not produce either "increase" or "diminution" of the principle of retentiveness or *Tamas*.

2 If *Sattwa* diminishes, this only can happen by a correlated increase of *Rajas*, and never by its diminution. It is why the term *Rajas* is synonymous of contamination or dust. *Tamas*, as in the previous case, it is not affected directly by the modification of *Sattwa*, but already the increase of *Rajas* operates its diminution.

3 The diminution of *Rajas* also corresponds to the increase of *Tamas* or inertia.

Thus are included the four possible direct movements of *Rajas* or activity, and the two of *Sattwa* and

Tamas. The *Rajas guna* is in the intermediate place of the three, and is the only possible connection between the other two. A defined order is conserved although what it seems beginning of a sequence can be seen from another modality like consequence, and the increase, like corresponding diminution, and vice versa. We move already in the circularity. We will not enter the formalization and quantification of a model that seems insignificant and that in fact can be complicated indefinitely, having been able any logician to treat this –that could speak to us about connectives, disjunctive functions, etcetera- with more pleasure and competence. We were satisfied seeing the order of the *gunas* as a scale or stairs that simultaneously allows the union by degrees and the separation or exclusion of certain immediate movements. That is to say, we have an elementary model of mediation, which admits almost infinite variations itself.

33

The explicit distinction between *vikriti* and *prakriti*, the present state and the drift of the previous states, are the unique thing that could give us a reference of the *gunas*, its complexion and evolution. The only thing, therefore, that could make this field worthy of a consistent and totally scientific study. Given its implicit or irreducible inherent character, is not possible that the *gunas* or the *doshas* show like explicit or exempt components; but without this reference, it does not seem possible its rigorous understanding and treatment.

Although the interpreter of the pulse must make this distinction to have the minimum of judgment certainty, it is not clear if he is able to make it explicit anyway. It would be said, rather, that he is based on the conjecture and the supposition, in addition to the intuition, although this last can be surprisingly precise and right. It can be based, in addition to the idiosyncratic properties of the pulse, in the judgment on the constitution of the person, who has certain hardly variable elements throughout the time; or in the colour of the skin, the aspect of the tongue and other semiologies. Nevertheless, all this is not but supports to delimit and to give context to a source of information, the same pulse, that would have to be and in fact it is more precise and faithful than any other index to consider.

Since we have the great advantage that the pulse is already an elementary form of temporal series, that would be render the analysis in a model form, it would be to wish that the reference of the past state or *prakriti* be equally doubtless an explicit in character. Surely, if we had all the series of the pulse of a person from the birth to its death –a number of beats of the order of $3\text{-}4 \times 10^9$ - we could make a quite comprehensive study of its evolution, its progressive imbalance and the increase of the disorder or entropy; but this is not a realistic perspective, since neither we want to wait for seventy years nor seems very feasible nor desirable to monitoring to a person along the whole life. On the other hand, the monitoring with sensors releases to us of the obligation to take the reading in conditions of maximum rest, and it allows us to make really dynamic studies in real time, with registries or tests of effort, pain, pleasure, etc. From here we can do quite valid extrapolations on the nature of the fluctuations of the pulse, balances, imbalances, and the form they evolve throughout the time; valid, perhaps, but still quite conjectural and fragmentary. By the way that this would be very fecund at the time of creating more solid protocols in the psychophysical studies and all those that analyze the relations between the mind and the body, although always insufficient without one more necessary and natural definition of the *triguna*, which is as well equivalent to define the relations between the potential of *prakriti* and the effective and present values of *vikriti*.

Really, which we asked ourselves is if both elements, present or actual and potential, are intertwined and present in the effective signal or if the potential only is a part of the past of the series, like would be to hope in a more conventional model, with a linear time that does not keep memory from its past states. As it is seen easily, this last one would be quite contradictory, if we consider the very considerable evidence of which the balance of the system cannot be made punctually, but scattering itself in a time interval, otherwise indefinite.

Nothing closer to the clinical precision that the analytical exactitude, nor furthermost simultaneously.

34

All this would put in enormous difficulties to us; when we try to analyze values from a more natural point of view, it would seem to be that the nature denies the same possibility to us to carry out this type of analysis. It is not to surprise that so many well-intentioned attempts to consider the dynamic systems with another perspective end inevitably at the failure. For a moment, everything seems to make the rigorous correspondence between the *triguna* and the variational principles of dynamics possible; soon, quickly, we return to realize that dynamics ends up imposing its own rules and forces to wash our hands of the ambiguous elements like strangers to its intention. Dynamics excludes many considerations simply because they do not make sense for it nor have space within. And this is very difficult, if not impossible, to change. When on the other hand we achieve to extend its variables, not for that reason such variables stop to be under the same excluding logic.

So must it be: in the infinite space of the analysis, there is no place for anything, but for the analysis.

35

Finally, the same nature comes in our aid. And it does through its asymmetry; or its symmetry, because both are interchangeable. Are symmetry and asymmetry mutual reference to each other? Perhaps not absolutely: rather all inclines to us to think that the symmetry is a purely formal reference, and that the asymmetries contribute the real contents. Nevertheless, once we found the terms of symmetry for a phenomenon, the contents of this one seem to volatilize in form of a mere particular case. Between symmetry and asymmetry, the relations do not seem to be nor symmetrical, nor the opposite. An antinomy: exactly that class of things that do not have place in the space of the analysis.

But we return to the nature. As we already said, some of the doctors who use the pulse diagnosis only feel the signal in one of the wrists, and others in two. There would be good reasons to suppose that a single wrist is enough, and that contains of *implicit* form all the information, having in account the highly synthetic character of the signal and its more than presumable unitary, univocal evolution. But that this can be so for an expert doctor does not eliminate its implicit character, which is just what we want to surpass in the direction of more explicit and measurable forms. Therefore, it is possible to suppose that the pulse of a single wrist contains all the necessary information, although in a more compact and apparently confused way, and that the other wrist can be used precisely like *reference* –just what we were looking for.

The Chinese medicine, for example, usually prescribes the reading of the two wrists. This, among other things, obeys to its breakdown of the twelve meridians, an essential feature of its etiology, in six for each wrist. Which, like almost everything in this ground, does not stop being a prescription or recipe of heuristic nature, even though can be justified by the results. And like all these heuristic frameworks, they change according to the teachers and practitioners. What all the practitioners of this diagnosis admit is the more than sensible difference between the pulses of both wrists. Traditionally it is said that in the left arm the movement of the pulse is clearer, and in the left one, its form. This is quite evident, at least for most of the subjects, but it would not even say why reason six meridians are assigned to one side and other quite different six are assigned to the other, even when we grant to these distinctions a high degree of relativity. On the other hand, the contribution of each meridian, organ or viscera can be very different in magnitude. For example, it is considered that the stomach and its associate functions or energies –and not the heart, as we could believe- contribute in near 4/5 parts of the global profile of the pulse speaking in quantitative terms; what it does not mean that the others are less important, but than they are subtler and more difficult to detect. The ayurvedic medicine would agree perfectly with the sense of this appreciation in spite of the terminology differences. Probably the organization of the meridians hides a very important symmetry –that curiously also is given in groups or semi-groups of five and six- but this one cannot be looked for this hastily and independently of the empirical nature of the signal and the concerned values. All these points can sound quite strange confronted

with the ideas that we have of any class of analysis, and of the clinical analysis in particular; nevertheless, I will insist on which they also are of unfailingly and genuine analytical character, and it is worth the trouble to have them in account at the time of doing an idea about what can we hope to find. We must omit many others necessary preventions because of the brevity.

36

In order to be brief, I will say that the pulse of the right hand is not only different, but also complementary of the one of the left hand. What it is not anything new and is in basic agreement with the more spread Chinese breakdown; also with the Indian, although this one often does without so precious reference to interpret the brute signal of only one of the wrists. Taking into account the distinction which we have done between the implicit and explicit values of the signal of the pulse, this must not be contradictory at all. The pulse in both wrists includes a totality; but its correlation allows us to open an enormous space for the analysis: now yes, also for the quantitative analysis of the temporary series.

For the western medicine, that tries to avoid the semiotic ambiguities as far as possible –vainly, perhaps-, and we do not say already for physics, the idea that the dynamics of the pulse in both wrists can be very different and simultaneously very precisely correlated will have to seem quite outlandish and absurd. It will think that, if there are differences, these are reduced basically to a minimum difference of distance of the arterial trajectory, and to other questions and accidents of anatomical order. In no case it will think that relevant functional differences for all the system can be revealed here –and that's what we are talking about.

For the glance of the anatomist, the basic bilateral symmetry of our body little means. One would say that it is an aesthetic ornament of nature; although for some organs, like our eyes, the advantage of the binocular vision is patent enough. But even in cases like this one, that evident functional advantage seems to close the passage to another type of considerations. That type of advantages can be applied in the most trivial form to the kidneys or the lungs, speaking about survival advantages and security mechanisms. Such considerations continues being entirely superficial. How to explain of what class of complementariness we speak about?

37

Our consciousness is extremely opaque to the vegetative activity of our organism, although this varies enormously from one individual to another. The circulation is one of those vegetative activities; also the main one. The most opposed, comparatively, it seems to be the breathing, which until the limit of the emergency, is a voluntary and extremely adjustable activity. Nevertheless, and in spite of this apparent contrast, barely it is possible to imagine more interdependent activities than those of the heart and the breathing. But since already we noticed before, the pulse, in addition to the one of the heart, tolerates other layers of vegetative activity.

Given its voluntary nature, it is easy to experiment how the variations or interruptions of the breathing do not recover of instantaneous way: a very long forced retention will leave its track cushioned throughout many cycles of breathing. It is exactly by this so ordinary experience in first person that we can understand of totally instinctive form how the same has to be valid for the activity of the heart or the pulse, although only indirectly we can feel them. For that reason we could speak surely before about the pulse of balances deferred throughout the time: we only suppose the similarity with what happen in the breathing.

Something we can be sure about: any phenomenon associated to the breathing will find its faithful correlate in the cardiac activity and the circulation.

Nevertheless, the breathing has a type of perfectly well documented asymmetric alternation to which almost nobody pays attention: the predominance of breathing between the right and left nostril is alternated each hour and a half, approximately. This alternation was important for the old ayurvedic medicine to such an

extent that it was said that if this alternation let take place by more than twenty-four hours, the subject was on the verge of dying. What, by the way, is not necessary to interpret like one superstition or fable, but like an almost irreparable dysfunction and imbalance. What means this alternation? Western medicine, even knowing it, has ignored it widely, under pretext of its irregularity and variability. As if that same variability was not the best index and source of information in all type of analysis, be they chemical, dynamic, or radiological. In fact, we know perfectly that it is not contemplated because it does not have place in that scheme of things.

As it is known, for the Yoga this alternation is not but the most visible manifestation of a more general underlying polarity, that affects to all the evolution and organic development. In terms of subtle anatomy, and in addition, in symbolic terms - that could be not merely imaginary, but the most general possible- that polarity is named as *ida* and *pingala*, the intermingled activity of the Sun and the Moon, with *sushumna* like virtual axis of the non-manifested. In much more tangible terms, this is translated in the two fundamental phases of the metabolism: anabolic and catabolic phase. Or, also, said with other words, words, creation and destruction, absorption and elimination, afferent and efferent nervous routes, vegetative formation and voluntary activity. In sum, these two phases would be the most faithful correlate of *kapha* and *pitta* or *Tamas* and *Rajas*, considered now not from the immediate point of view of a modification or fluctuation, but from the global economy of the organism. Apart from that, all the Yoga can be resumed in making the peace and obtaining a lasting balance between our vegetative and voluntary sides.

38

The only area of the modern physiology in which the functional asymmetry within an apparent symmetry is investigated actively is the neurology; everybody has heard about the specialization of the cerebral hemispheres, and even the subject tends to be trivialized, about which nevertheless it is known still so little. Then it is just here where the local analysis and the scalpel are more impotent. It is something beyond doubts that the specialization of the hemispheres exist; but of the details of this specialization and the correlations between the functions of both hemispheres, it is very few what presently can be known. This way, the modern physiology has had to assume the asymmetry only for the so called "noble organ" –as if the other organs were not -, there where it is more difficult to study the phenomenon, and without realizing that is not but *an effect* of a much more general phenomenon.

In effect, there is much noise whereupon if the left hemisphere –that by the crossing of the nervous routes corresponds to the right side of the body- is responsible of the logic and linguistic functions, and the right hemisphere –corresponding to the left- contains the imagination and the spatial representation. Only of this, many already make a mess, assigning an "analytical" character to one hemisphere and a "synthetic" character to the other; when the truth is that the mathematical analysis, for example, can require a use of the spatial representation and much more intensive imagination that in other activities considered more "creative" or "artistic". And it is that everything is badly approached if we remain isolated in the cognitive dominion.

Certainly and surely, both cerebral hemispheres are not but the more elaborated and complex case of the polarity or basic alternation that we have aimed: the one of the voluntary and the vegetative activities or tendencies. These two aspects, as we know, have their particular centres and differentiated routes relatively well known: cerebellum, nervous plexuses, etc. We simply affirm that both continue reproducing entirely *also* in the whole cognitive plane of the conscious life. What it seems incredible is that we have still not repaired in it.

39

Everything which will continue maintaining to us in the perplexity and even in the incredulity; to such an extent our "cognitive style" has conditioned and has put our ideas of the space and time onto the rails. Yes,

because we are speaking also about time. Once again we are forced to reflect on nature, and not with instrumental pretensions, but with spirit of fidelity.

Let us think about a tree. We see a certain lateral symmetry, in spite of apparent disordered caprices in the ramification. The basic lateral symmetry makes think us immediately about the growth: in fact, it is one of our more appraised images at the time of representing the unidirectional time to us, with all his cumulative factors. But we cannot see the most remarkable symmetry, because it is sunk in the Earth: the one that form the roots with respect to the branches, with the ground like irregular plane of reflection. And just this symmetry hides also the most important asymmetry, in which barely we think –although all we noticed easily the enormous functional difference that exists between the roots and the branches. Here the circuit and the polarity are made evident and acquired their inevitable character.

Exactly the same happens in our body.

Only the conditions change, being very different. Because we don't need to say that we do not have a part from us to the sun and the other under earth. It has changed the direction of the symmetry axis, and in addition, all the surrounding environment. But the polarity and the difference of phases remain. It is not that the animal, emancipated of the vegetative sleep, becomes "tree without roots", except in the most trivial and apparent sense. We are rather whole trees, with the roots inside.

But let us think in addition where a tree has its "head", if we don't confuse it with the top. Since the more "autonomous" and "voluntary" –willing, perhaps- part of a tree is in the wedge and spearhead of its roots, which become the most similar to our brain. This brings inevitable resonances to us of the great Vedic image of the cosmic tree with its roots in the sky and its branches towards the ground. And if somebody has doubts on that it is in the roots where the tree unfolds its autonomy –as relative as any other, of course -, he could think, to the way of the poet William Blake, where are the "devouring" and the "prolific" elements here: anyone understands at first sight that the roots are the devouring element and the branches, flowers and fruits the prolific; on this there is no doubt.

And it is by this that the vegetal world wakes up such resonances in our soul: because, unlike us, it is justly the vegetative part the one that elevates its sleep and dreams before the Sunlight and before our own eyes.

40

Thanks to the tree of our example, we are able to conceive something that in another way would seem more than doubtful to us: that both sides of our bilateral symmetry have their fundamental reason in functional differences. Therefore only this way the balance involves something real; because two equal things do not need balances between them. And this balance must involve more or less regular oscillations and therefore a circulation with typical differential aspects. And thus, the most typical manifestation of this functional asymmetry will appear naturally in the time, and indirectly, in some of its dynamic aspects.

We could think that the very complementary aspect of the arterial pulse is the venous pulse; in the jugular one, for example. Willing to look for so valuable reference, nothing is to discard. Nevertheless, the venous pulse seems to show more information on the circulatory return and the same heart that on the joint balance of the system. And although in the organism any element can be revealing on the set, the certain thing is that they seem too different signals in order to look for its correlation, superposition and interferences. Naturally, the same heart exhibits a bilateral symmetry that hides an evident functional asymmetry, the one of the arterial flow and the venous reflux; the best possible summary of the external influence through the breathing and the internal reflux from all the parts of the body. This asymmetry also is reproduced between the auricles and ventricles; and the crossing of these two different and coincident asymmetries of the horizontal and vertical axis is like an anatomical epitome of that difference that we find in the dual flow of even the two arteries of the wrists, more extreme than parallel. The anatomical crossing only shows us an external analogy without apparent causal connection with supposedly parallel lines of action; but it is just here where it appears our blind point with respect to the perception and conception of the time –the same mind is not able to

perceive nor to take care of two different simultaneous courses, but must suppose them parallel, that is to say, simply spaced. Apart from that, one is allowed to suppose that it is the function what creates the organs, rather that on the contrary; but only the more careful experimental study of the correlation and differences of the pulses can throw light and evidence on this as surprising as unexpected question.

If somebody still doubts, he may think about what a nonsense would be the symmetry of the tree with its roots if it were a simple space symmetry. We cannot imagine anything simpler, because it would be simply gratuitous. In addition, that spatial symmetry is far from being regularly fulfilled, because of the very different conditions that exist outside and under the ground. Therefore, this symmetry mainly exists in the growth and the time, and in the cycle of circulation of the sap that the tree does entirely. We would say, even, that it exists mainly in *the spirit* of the tree. And in this polarized game with the environment has the tree its reason.

Let us say, then, that the complementariness of the arterial and venous circulation finds its faithful correlate within the same arterial circulation under the appearance of the space symmetrical bifurcation –the two radial arteries that we adopted like mere reference, just as we could adopt other arteries with ampler signals. As it is well known, the circulation process is far from simple; the venous reflux is quite complex, and a certain number of beats is needed for the whole renewal of the blood. It happens, in addition, that the venous circulation is, from a point of view, simultaneous to the arterial circulation, and, from another point of view, it is successive or subsequent to it. Then, assuming a great simplification, and attending to the most relevant differences, we can venture that what in the arterial-venous pair appears like simultaneous, must appear successively in the duality artery-artery, and on the contrary: what in the venous-arterial pair seems successive, must have a correlate of simultaneity in our reference artery-artery. Why? There is neither place nor time for anything else, that's because. That's to say, this is the main condition for the balance in the undivided. And thus, at a blow, a new light is thrown on the same knot, cross or blind point in our time-space conception; and, very probably, on many antinomies present in the different areas of the analysis. Light that, of course, we shall have to follow in the direction of the source.

The circulation of the tree has more to do with the real time that all the clocks invented since Galileo's pendulum. And their roots take us further and deeper than all the modern cosmologies, with their great explosions and enormous numbers with a metronome rate.

Before the difficulty and schizophrenia that would suppose for anyone of us to conceive the "two sides of the time", the image of the tree comes to redeem to us and to make us sense a unitary time and rate, conserving all its enigmatic character. I would dare to venture that, if for something the content of this poor writing reach some reception, it will be by this fortunate image and its eternal evocative power.

41

Truly, the ancients knew to grasp this notion of the time, so difficult to conceive for us; although only the symbols have lasted, some of them so eloquent in their plasticity: they are the two foreheaded Janus, the double axe, the bicephalous eagle, and other many of identical character, that express more openly what we already found in the tree. To say of these symbols that they are allegories of the time, with the present moment watching towards the past and the future would not help us much, because almost none of us makes both things simultaneously neither at the happiest moment. One ignores therefore the weight and plexus of the symbol, that is to say, its almond. Nobody will be able to represent this time in a point, except like symbol also, but only a formal symbol now, and dispossessed of its complexion - that is precisely what the ancient symbol alludes.

But we must leave the mysteries and try to approach the difficulty. Metaphorically speaking, and without the smaller scientific pretension, we can conceive the anabolism and the formative, plastic capacity of the organism like watching in the direction of the past, and at the catabolism like watching in the direction of the future. This is not unjustified in terms of biological development, since the formative phase must count with which there is already present, that it is supposed that "comes" from the past. On the contrary, we can conceive the catabolism like "free" of that observance, and for that same reason, and because it continuously opens a route of action of opposed nature, we attribute the opposite direction to it, in the direction of the

future. As it is seen, indeed we can conceive simultaneous activities here, but we realize perfectly the metaphorical sense of that words: we know that from the past nothing comes, and know that nothing "goes" towards the future; that both things agree in a same time and what differs is the nature of the activity. But if we see with facility this, we have already obtained something, because in fact science never can see it thus.

Of course, we are turning a time dominion into a certain space not well defined. For physics, the particles have the property of impenetrability in the space, a corollary of the inertial systems. Nevertheless, for the waves, the precisely the opposite is predicated: two equal waves in opposite phase and direction become annulled at a certain moment and return to emerge following their original direction. It is the called principle of superposition of the waves, in the antipodes of the impenetrability of particles. By this same one usually says, to simplify, that the main attribute of particles is the inertia and the one of the waves the energy transmission, although naturally anyone of the two implies both.

The Samkhya assumes the existence of atoms; but atoms of time, if thus can be said. And the only which we can conceive like "atoms of time" are not but the waves –only that time waves, unlike the more spatial waves before mentioned. These waves of time are, in last instance, the *vrittis,* the same fluctuations of the *gunas*. Will obey these waves the superposition principle, will they have penetrability? Surely they will, if we conceive them seriously like waves. This way, it is possible to conceive also and easily that a moment of time can contains several values and supports simultaneously different activities, stopping to be a passive point for the mere representation in space coordinates. And of course, in the evolution of a dynamic system we can superpose at every moment of time not two, but infinity of different variables, provided they fulfil the minimum exigencies. Conservative exigencies that, in last instance, are equivalent to the impenetrability of the inertial systems, although are not reduced necessarily to it.

We could say then, without contradicting the conservation laws, that *an interval of dynamic space* exists when two conditions cannot occur simultaneously in the same point –by the same reason we defined any circulation phenomenon before. After all, even particles have "intrinsic" frequency and spin, so called because they cannot be reduced to the space representation. In its generality, this would be valid so much for a particle, an interval of the sanguineous pulse or a tree. In this way (bounded) time would begin to roll by its own rough ground.

42

One of the main reasons to reject a priori the information that can offer the analysis us of the pulse is to consider that it is a signal poor, precisely, in information. Really, many think that, even if we accept that it is symptomatic, the signal is excessively synthetic. What deserves some comments.

Of course, the modern clinic analysis is not precisely poor in data, and even so and everything, it is always wanted to get more. Is to have elements for the *judgment* –synthetic act par excellence as far as we understand, and that Kant treated like a faculty. Precisely the judgment is the easiest to lose with the increasing flood of data, and I suppose that the doctors of the modern hospitals, not to mention the epidemiologist, must know this enough - in fact, all we began to know this enough, and I am afraid that we will still learn more. From this perspective, and at least in the clinical dominion, may be an *excessively* synthetic information can exist, but, even so, not synthetic enough, yet. On the other hand, already we said that the brute feature or performance is properly the best object of the analysis, on which is not necessary to insist.

It is not possible to say that the pulse is poor in information since the moment that we ignore the factors of its variability. Let us say rather that we are incapable to read it. I will admit nevertheless that it is very difficult to believe that in this signal we can obtain the necessary or sufficient information to the judgment, specially if we measure it with the standards of the modern exigencies. But, as it was said, we think that the correlation of the signal of the pulse of both wrists not simply duplicates, but multiplies in an enormous factor the possibilities of the most explicit, neat and detailed analysis –because the difference or complementariness of both signals is not of trivial character, but extraordinarily complex. That is to say, the more detailed analysis, within the suitable frame, would show this complexity by itself, and this wealth of

information. Let us repeat it: within the suitable frame; because studies of the correlation of the signal of both wrists already exist in a great number, without having reached, as far as I know, to anything essential.

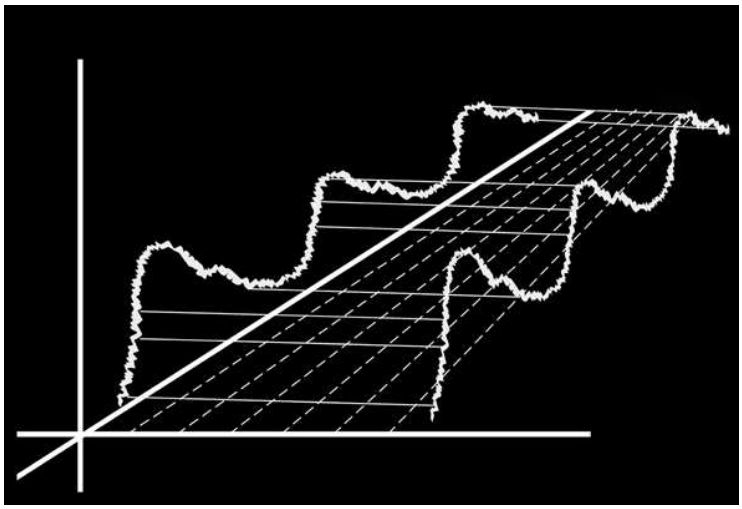


Fig 5

But it is that –apart of ignoring the long duration series- barely it has been done anything but *to compare* the pulses, being impossible to speak of authentic studies of the correlation, and not suspecting its depth; or rather, without suspecting that this correlation is revealing exactly in the more strict analytical sense, the physical and mathematical one. Without a doubt, it has contributed much to this circumstance, not only the separation between doctors and applied mathematicians, that nowadays is crossed by numerous bridges, but the spread prejudice on the "qualitative" and "specious" character of the signal of the pulse and, mainly, its frame of interpretation; prejudice whose dissolution is the front door to the content of this book.

And it is that, in the style of the mathematicians, we can speak of analytical continuation or extension when we open the space of correlation between both pulses. And practically in the same way: extending to the complex plane the different values of the real variable of both systems.

43

Independently of any method of analysis that we want to use, and even accepting the symptomatic and even revealing character of the signal of the pulse, it is very difficult to take off of the mind the idea that this signal has to be full of contingencies, as much more when more in detail we study it: from anatomical injuries and peculiarities to all a series of uncontrollable factors. Since I am not a doctor nor I have any direct experience of the subject, I will not dare to affirm that any law or contrastable correlation in this area cannot contemplate exceptions. But, admitting in principle this possibility, mainly when we have not even begun to establish the smaller correlation, it necessary to say that we tend to enormously underestimate the capacity of adjustment of a global signal like this one. The balance has been there from the beginning, from the first anatomical bifurcations, and the smaller anatomical differences will even end up finding their functional correspondence and its resonance through the sequence or temporal series. Whatever it is the contingency, this will appear reflected in a double way and in the same measure in which it has some importance for the economy of the global balance of the system; it cannot be another way. Naturally, I already start from the

assumption that in the pulse *any* factor that concurs in the state of health has to be reflected in direct proportion with its importance: until infinitesimal extremes, if we could follow them. The somatic unit is as much unit as the mathematical unit, that is to say, the number 1, also known like the monad or undivided totality by the ancients; and it is the problem of the anatomists in how many parts can and want to divide it. And if we cannot take off of the head the idea that the pulse, like the activity of the heart and any biological oscillator, has to continue maintaining uncontrollable irregularity or randomness, it is necessary to remember that this same randomness is already itself a measurement of *vata*, the total sensitivity of the system - and the most direct measurement, in addition. So everything depends on which are our departure coordinates, and the *triguna* or the *tridosha*, being from the beginning of global nature, can assume all those contingencies without the smaller difficulty –we rather are those that have lost the skill to think this way. And this way of thinking is in fact much more natural that all the clinical analysis protected in last instance by a formal mediation, like for example the biochemical data. Nobody happens to think that the sound of the motor of its car lies, although is far from distinguishing everything what it is saying. If this happen to us with a car, that barely has some thousands pieces, I do not see why the human body must not have expressions immensely more precise and trustworthy, without possible comparison. The same we could say of the human voice; the problem is not of lack of information, but of to what extent and within what frame we can analyze it.

The performance is present, and its composition, purely virtual. This is valid for any etiological model, also those of the modern medicine: we will always be able to find an endless number of interchangeable causes that adjust to the data that really interest to us. And precisely the doctor is the one who less can renounce to this meaning of the analytical and the synthetic spheres: if he does, already renounce to his very competence.

Let us remember that the same state of health, as feels it a subject, is another synthetic phenomenon par excellence: with the own life, the most general performance of the organism. To describe this simply like "subjective" seems to me only attributable to the awkwardness of our means of judgment.

44

On the nature of the correlations that we can find between both pulses –synchrony and phase lag, additive, multiplicative, periodical, etcetera- little or nothing we can say, unless they deserve the most careful and detailed study. This is an experimental investigation, and it is in the experimental measures and values where the analysis tools must sharpen. Not even we can advance what would add the correlation of the waves with the complete form to the correlation of flat or simplified waves; we cannot either anticipate what adds one to the another at the time of determining the values of the *gunas* or *doshas*, nor to what extent we can do without these in aid of a precise definition in terms of potentials. The relation between *prakriti* and *vikriti* does not have why to be identical to the relation between the vegetative and voluntary aspects, but in any case the product of both pairs must throw the same values. As far as the correlation between both pulses and the bilateral alternation of the breathing in the nose, it does not have why to give a similar frequency or amplitude at all, since from the beginning they are, even connected, very different cycles. All this and much more only can be refined with the experimental contrast, that is what this writing tries to stimulate.

I take advantage of this point to say that hardly will be never an investigation that can obtain such advances with so tiny means: sensors to obtain measures and a computer to analyze them. In addition, before venturing to us in the subject of the correlation of both pulses, a standard determination of the measurement of *doshas* and its proportions would have been seeded of difficulties and arbitrariness, in addition to have needed samples of pulse readings on many hundreds subjects. It was, really, the most costly and discouraging part of this type of investigation. Now, based on the correlation of both pulses, I hope that it will be possible to start to collect relevant data from the same beginning of the research, beginning here also the work of analytical refinement that this field is demanding. Of course, this does not exempt to us to do many more measurements

and samples, and in particular the dynamic studies of series with the subjects under effort and activity, that seem to be specially promissory and revealing, also at the time of verifying faster the dual terms of both pulses; but the fact that already from the beginning we can take the bull by the horns would have to be stimulating.

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When we try to think about what class of organic time is going to reveal these experiments to us, barely we make another thing that to come up against old categories and old ways of thinking. We could imagine fibbers being contracted and dilating towards the past and the future; or we could think about an expanded present whose entropy equally increases in direction towards the past as in direction towards the future, etcetera. All this barely as it is another thing that to intermingle qualities of some well-known systems discarding others to give other possible systems, but it seems to me that to speak about past and future it is particularly deceptive for the type of behaviour that we look for; if we truly enter it, these words will be used perhaps with the only intention to understand us, that is to say, without more value than the one of the analogy and the metaphor. In our daily life at least, past and future are no doubt important references, but few will have wondered to what extent they are necessary. My opinion is that much less than what is believed, although everything depends on the type of necessities that they want to get us involved in. It is more, I think that the distinction between two directions of the time is of identical nature that the distinction between subject and object, and equally illusory. Unlike the more spread present scientific vision, that also tries to be beyond the distinction between the past and the future, but it does it being based precisely on the distinction between an objective physical world and a subjective and diffuse perception. What of course it is a funny inconsequence. And from this inconsequence, already only remains to search how the subjectivity can be produced, how is synthesized.

In effect, when science approaches self-organization phenomena like the biological ones, it does not seem that it can do without the question of the memory anyway. At the cellular level, many things seem explainable by means of the genetic inheritance, which assumes the role of initial mechanism of data transmission through the temporary drift. Yet, this "memory" rather is reduced to the elaboration of biochemical components, needs to be updated by something alien to it and in addition hardly can explain itself all the cellular grouping phenomena of superior order: until the point that there is always somebody ready to introduce some type of doubtful "inherent dynamic memory" to the system. For me, the single fact that either the memory concept is used implicitly, even in the case of the genetic material, seems to me somewhat suspicious yet: it is already a form to disguise the same objective-subjective division that is present in all the other. That is to say, a causal reconstruction of the subject is searched –an imaginary composition -, because we are incapable to know what it is happening in a simple cell in any given while; hardly nothing on the evolution in real time, that so refractory seems to be the analysis. By the way all the cells pulse, and not only those of the heart.

This inconsequence emerges finally, and of the most spectacular form, in the subjects and businesses of the great black box of the "noble organ", our brain. The last frontier, as some call it; but that seems to us so equal to the others, except by that complexity in which we can take refuge. Here, the neurologists speak with any faith of the details of the short term memory, defined more or less by the temporal threshold in which the memory really does not need to be memory, but an expansion of the specious present. As far as the subject of the long term memory, nobody will pretend to have the smaller idea on where and how it can be stored; surely because it is not stored at all. It cannot be but an expanded version of the expansion of the actual present in which consists the so called “short term memory”. What it does not exclude the fact of the complexity of the neuronal plasticity, but rather justifies it. Be cause if the memory were really stored, the cerebral architecture could be infinitely simpler, aside that there would not have been as much problem in finding it. We are sent then to the difference and correlation between the vegetative and the volunteer, where is the true knot of the subject; beginning with the characteristics of the temporal series in both hemispheres, which constitute the

most global and accessible of all the behaviours. And although like a mere formula it could seem very simple, we can believe that it contains surprises enough to maintain the researchers busy, as well as to remove unnecessary and spurious concepts. If we are sure of it, it will be because this evasive principle cannot be reduced to a particular dominion.

SECOND PART

TIME AND THE MODERN SCIENCE

46

It has been said, with that half truth so usual in the topics, that if the Greek mathematics were geometry, after Newton were mainly analysis. Affirmation that would be right if it is considered that the analysis grew mainly in the applications to physical problems, but that it is simply illusion from the chronological sequence of the facts.

We are not speaking about the old controversy on the authorship of the calculus, that already has been settled by the historians: the calculus was not invented neither by Newton nor Leibniz, but these were rather those who crowned it after a great number of previous contributions, and little matters who was first in possession of one or another formula which would fall like mature fruits. They two, without a doubt, did much by their maturity. But, in which does to the superseding of the spirit of the geometry, it is to say that was not Newton who took the first steps, but all the opposite. If we admitted its own later commentaries, that we have to believe, the calculus methods that could use for the incubation and elaboration of *Principia* did not have another dignity that the purely instrumental one, without giving the smaller substantiality or autonomy to them. Justly thus would be conceivable his absence of publications on the subject. The perfect counterpoint of this situation we have it in Leibniz himself, certainly much poorer of positive achievements. Leibniz conceived indeed from the beginning the calculus and the analysis like a new plane with proper autonomy and already freed from geometry, although, buried by the servitudes, barely he had time to explore it. What Newton took advantage of for more than three lustrums to perfect industriously all class of techniques and to demand the pre-eminence of his authorship. But what says the previous works of both, there for 1686?

That the *Principia* are the most arduous bobbin lace of the history of the geometry, and that *the Treatise of metaphysics* or *the Monadology* are the treatise less interpretable in plastic terms of all the history of the western philosophy.

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Without a doubt both Newton and Leibniz had to pay a tribute to their century; but whereas to the first that tribute benefitted to him enormously, to the second has impede any type of keen of reception.

The first French review of the *Principia* praised their geometry, but they advised to the author the improvement of all concerning to the "physical causes"; what listened with nowadays ears, seems to us the height of the impertinence. But all the perplexity before the hypothesis of the remote action at distance was justified enough. And Newton himself had to end up realizing that the best justification of the gravity law was not other one than the own space of the analysis, released of the servitude of geometry and the mechanical

argumentations. In as much he was assuming this, the authorship of the calculus grew in importance for him; all this agrees very well with the sequence of the facts.

And precisely, it was the familiarization with the idea of the calculus the one that achieved that, half a century later, when the Newton theory became popular, people as Daniel Bernouilli or the same Voltaire no longer were surprised at all with the idea of the remote action at distance and even found it natural. Known it is the phrase of Voltaire on the matter: "the analysis is the art of calculating and measuring with exactitude that of which not even we can conceive the existence". It was the analysis and the analytical mentality what gave its credibility to the theory of Newton, and not on the contrary. And when still today we considered that the force of the gravity has to be a constant, we only paid a tribute to the analytical exigencies, and to no intuition at all. The immaterial ideas of the analysis are those that more have contributed to our belief of a world of inert masses, what is truly antagonistic and paradoxical.

The case of Leibniz was right the opposite, like it had to be for the counterpoint of this baroque fugue that still lasts extending and losing itself in other spheres. The philosophy of Leibniz is, in spirit, entirely musical: it is the first of the philosophies in transcending entirely the *more geometrico* within the rationalism and also the last one. But nothing harms more the understanding of Leibniz philosophy than the plastic images, of which he himself was sometimes involuntary responsible. Then what can seem the monads to us but a monstrosity having in mind mirrors and clocks? Still today, if instead of thinking about watchmaker machineries *ad infinitum,* we replaced these by waves, a great part of the work of Leibniz acquires clarity as if by magic. And about waves he must have spoken, changing in this one of the motifs of his mentor Huygens by the other one. Known are the difficulties that Huygens found for the mathematical elaboration of his wave theory of light, question this one that prevented its greater diffusion; what perhaps it is not recognized so often is that the Feynman paths of the modern quantum electrodynamics are not but the principle of diffusion of the light of Huygens –*from all the points to all the points by all the points*- with a finite speed for light. Leibniz is the most fresh, shining and intuitive philosopher of the modern thought, and the less discursive of all in his best moments; but it is the mere discursiveness of modern thought, united to the poverty of its power of imagination, what makes him to seem like an old rusty calculator.

But, again in tragicomic contrast with Newton, Leibniz barely had time to mature anything of which he did and discerned. Been born in a Germany devastated by the war of the thirty years, forced to look for the life, half adventurer and half poor devil, loser in all the roulettes of the fortune and the posterity, it is impossible not to sympathize with him. Even their spiritual disciples and heirs moved their look away from him discretely and tried to look for the inspiration in his more implacable rival. But the things always follow their course, ignoring misunderstandings.

48

Leibniz even got to challenge the Galilean principle of relativity, alluding to the impossibility to establish the correlative movement between two moving bodies. This only acquires sense within the prevailing role that it granted to the activity and energy over inertia. But these considerations moved away more and more of any practical approach. Right it has been said that the dynamics of Leibniz is the dynamics of the moving without movement –this is, without a space correlate -, whereas the mechanics of Newton is movement without moving.

The pre-established harmony of Leibniz, for example, for most of us the summit of the arbitrariness, acquires its sense and relevance in as much we realize that the absolute time of Newton, the principle of global synchronization, it is not less arbitrary nor metaphysical at all. And not only that: if we perceived the net metaphysical character of this last one, we begin to understand or to suspect at least that to which Leibniz is alluding with the question of the pre-established harmony it is exactly to the possibility of synchronizing entities and processes that are asynchronous themselves, since it is from their own that derive their law. But on the other hand the monads not even exist in the space, but are location principles, as much with respect to the space as with respect to many other substances or planes. In the same way that only for asynchronous

processes can have something to synchronize, exists the non-localized for the locality, in a way that only partially can leave mark in the space. Leibniz himself defined the point like a pure modality.

49

All the philosophy of Leibniz exists to conserve the rights of the contingency; for that reason it is articulated around the modality, which it is unfolded and fluctuates within the scale of the necessary, possible and the contingent. On the contrary, the three principles of Newton exist to exclude absolutely the modality, to evacuate it, although it is virtually impossible since the necessity already is modality. On the other hand the idea of physical constant, that for Newton was not clear and only instrumental, it is not but a superstition generated by the effectiveness of the infinitesimal calculus, that the later developments have only contributed to underpin. A universal constant only seems to justify itself by the fact that without it the calculus would become impossible; but this is more than sufficient, so that actually it is outside all question, unless the facts insist obstinately on denying it, in which case, or can be ignored or can consider another different maneuver.

50

The idea of the monad continues seeming so strange that still today few are the ones that begin to decipher it. Because it is not the trite and empty figure of worlds within worlds –one more of this misunderstandings in plastic terms- but mainly of which coexists of lateral way. The monad is mainly centre or focus of activity; one of its planes or substances can be a body like ours. This body can be made of infinity or an undefined number of parts that concur in the activity of other monads, that are not only bodies as well, but other many substances. Of course, always results something unnatural and inconvenient to speak in plural about the substance. Here, the substances have parts and attributes, but not therefore the monads. What all this is suggesting is not that we are done of many beings, but that the parts that apparently we occupy are and exist of natural form in the sphere of other monads. This is moving, and in particular for the western philosophy. But how we could hope that modern science could contemplate subjects like this anytime? It seemed much more out of its capacity at the time of Lebniz, and so it seems today.

51

But a monad is a purely dynamic entity, not a substance whose bottom remains indefinite for always. It is much less abstract than this one, or that the idea of the space and the time, and all this only serves to generate confusions. It is the whole, undivided totality, and when we are feeling or measuring the sanguineous pulse, we are verifying in a greater measure the activity of the monad one that the own activity of the body. Then, any reflection of the totality, by small or tenuous that is, belongs more to the order of the monads that to the one of the substances and its attributes. Only for the moderns could appear this like incredible, because in fact the monad is the most natural concept.

Let us think in that other formula apparently so strange –and unnatural- of which the monad does not have windows. This tends to interpret in the sense that the monad is completely isolated of the environment. And nevertheless its relations extend to the infinite, and in continuity. But also this has a faithful reflection in the pulse and the maintenance of its potential: if the sensitivity of the system, that is its limit with the environment, also enters until any internal depth of the equilibrium or balance. This one is precisely the necessary and sufficient condition of any autonomy and self-organization. The monad is the most natural conception of a system that already contains to its environment like part of its definition.

52

Dewey described with skill the general tendency of the German philosophy like apologetic, and to the one of the British philosophy as sceptical. Without a doubt it has been so; although as this last one was assumed by the scientific practice, the boot's on the other foot now. Science long ago became apologetic, and every time are more those that are sceptical with respect to their assumptions and justifications.

The same figure of Newton supposed a decisive mutation of the philosophy of the islands; a rationalist contamination of the continent lodged in an empirical panorama with vocation to remain formless and so without commitments as can. Why it is described to Newton like introducer of the empiricism in science? What consolidates is exactly the opposite; in addition, the experimental method in physics already had received its baptism in Galileo. It is no wonder that since Newton the susceptibility with respect to the continent is sharpen, and that is tried to digest the influence until making it invisible and non existent. The controversy between Newton and Leibniz is knot and symbol of the relations between the continent and the islands to the present time. Although a germ, still visible, has remained without digesting.

53

At the beginning of century XVIII, Hermann Boerhaave, the most famous doctor of Europe at the time, undertook the attempt to rationalize the practice and theory of the medicine to image and similarity of an experimental physics totally consolidated since Newton. Boerhaave looked for yatromechanical principles of the maximum simplicity, even knowing the enormous difference between his dominion and the one of the mathematical physics. Although the school of Leiden left track in the attempts of renovation of the modern medicine, Boerhaave and their followers had to be satisfied with little more than an appeal to the experimental practice, reason why they could have resorted equally to the name of Galileo or the same Bacon than to the one of Newton. The simple principles never could crystallize in the medicine neither in Biology.

The yatromechanics, the medicine of mechanical inspiration, looked for the definitive overthrow of a certain medicine of chemical inspiration –the yatrochemical medicine, whose origin send us to Paracelso- in the same way that the experimental physicists had turned obsolete the scholastic disputes. Chemistry was understood during centuries, also in the West, like the science of the Nature and their transformations par excellence, but, being their categories too qualitative and tangled, the moment arrived in which their principles seemed too vain and specious in comparison with the much more net defined and manageable of the mechanics. The paracelsians spoke of three fundamental principles, deduced empirically of their operations of combustion, elimination and distillation, and in this they agreed with the basic philosophy of other previous medical schools. Nevertheless, of what they could separate of elementary way of inert substances was little less than impossible to say nothing organized and reasonable in terms of active and undivided relation.

Nor we have to say that these three principles, sulphur, mercury and the salt, were completely equivalent of the *triguna* and of *tridosha* of the ayurvedic medicine, or, to speak the more sure, they were exactly the same.

54

The three principles of the Newtonian mechanics become the three inherent modalities of the nature with a single condition: that they cannot occur simultaneously. That is to say, that any operation of

reestablishment of the balance consumes time. Naturally, this changes everything to it, and in much greater degree than it is usually considered acceptable. And nevertheless, it is not necessary to say that the conservation laws would continue prevailing at a global level and as it is of rigor. Therefore, this version would not be an apex less rational than the well-known mechanics or dynamics; but surely it would be much more realistic and it would put to us on a very different game. And to where would go the time in that game?

We have already seen that in hydrodynamics this has enough sense. And it has particularly in the quantum mechanics, where we cannot do without the times of reaction; also local violations of the conservation principles occur here that tend to recover globally as soon as possible. And in addition, there is to count on the fact, frequently forgotten, that the law of conservation of angular moment in Newtonian mechanics has not the same axiomatic rank that the three famous principles, because it starts from the condition in which punctual particles has the same line of action –an extremely weak condition, as we can see, and that in most of the cases it has not why to happen neither in the quantum mechanics nor in the statistics nor in the hydrodynamics, except by average.

55

It seems to be that Leibniz was the first in using the term *function*, which would not be a surprise taking into account that he was also the first who understood the power of the idea of *tendency*. This was extremely important and even, as Bloch remarked, the modern idea of the dialectics is unthinkable without it. But, as it has been said, the same process of the calculus and the analysis, by examination of the successive approaches, is of dialectic nature. It does not belong to a "normative plane", nor is mechanic but for those for that the solutions are given. On this, the present mathematicians could say more than the mathematicians of any other time, but, lamentably, like last consumers of the mathematical production, between us the inertia prevails. In Newton any dialectic conception shine by its absence, which explains that he did not recognize the calculus although he was calculating all the day and had in front of his nose the whole time. Like Moliére's character, it spoke prose without knowing it. The history of the controversy of the calculus is as simple as this: To Newton, born analyst by pure scruple spirit, and next to their colleagues Wallis, Gregory and Barrow who already almost had crossed the bridge, their own methods had to be suspicious to him, and even worthy of being hidden. To Leibniz, virtually isolated in the continent, the method itself had to seem a wonder to him –with reason-, and dared to publish first and to generalize with agility and trust the most natural notation. To this the facts are reduced, but not the implications neither the resonances. And for the idles that always gives the things by known or supposed, we remember that sixty years later of the appearance of articles of Leibniz, Euler racked his brain trying to define the concept of function; or that barely metaphysical Gauss spoke without shame of the "metaphysics of the infinitesimals" at the beginning of the XIX century. Really, the basic moment of the appearance of the calculus is the overcoming of geometry. Leibniz was the first who gave that step; and to that step forward in the vacuum of the analysis must all the modern physical theories their main source of credit.

In Leibniz a single idea of tendency, considered in all its amplitude, serves to include potentially the physical world as much as the organic one with no need of a special distinction: the development is inherent to both of them, although nothing is gotten to specify and the role of the time is completely ambiguous in this respect. The principle of least action, to which the German gave with reason great importance, its not really specified either, although he includes potentially in it a much more vast scope than the contemplated by the present dynamics.

One of the less noticed and considered aspects of the view of the world of Newton is the absolute disconnection of any historical or evolutionary factor when contemplating the Solar System with its planets. In fact, Newton maintained a catastrophic vision: God had put of a blow the world in that state, and when he wanted that state would stop exist. Madly scrupulous, Newton didn't deceive himself about this, like about everything of his competence. Long before Poincaré, he suspected the absolute fragility of his laws before the

eventuality of comets or any other source of perturbations. With the greater solicitude, Newton knew that *his* world slid magically in the nothingness, unlike most of their successors, infinitely more mediocre and narcotized already by the effect of the custom and the interests of the accumulated capital. To reach the recent times, in which the most innocent of the naturalists or the biologists arrives trusted to us to explain even the origin of the species and the life by means of mechanical principles and everything within a reasonable term of time.

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The attitude of Newton and Leibniz to face the tradition of the past cannot be more opposed either.

Leibniz, in the purest apologetic tone, made always generous efforts to conciliate any scientific development in perspective –and he had a quite ample one- with the spirit of most of the old philosophy and with the mysteries of the religion, that not its dogmas and doctrines. Not in vain coined the term *philosophia perennis*, like pole of the wisdom that would have to transcend the circumstances of time and place. His integrating effort was sincere, and tried to give new senses to the motifs of the ancients and the contemporaries from its own spontaneous, original and superabundant source. Then precisely to him, that so lamentably had to leave dozens of important concepts and intuitions to develop, we can suppose less needed than anybody of other people's ideas.

Unlike Newton, who always was persuaded of *the knowledge* of the ancients –but not so of their wisdom -, thinking that the more perspicacious among them had transmitted it hidden in cryptograms. It is a funny idea that the ancients had to contemplate the things in the same spirit that the scientists of the XVII century, and had to understand them in such terms. Conception that, in addition, is not very different from the one of so many mystery and fantasy novels. That's to say, no real mystery, only secrets to crack. The same author of the three principles of the mechanics was secretly arrian only to deny the idea of the trinity, that it seemed to him a fiddle of the Church fathers. In this way, he denied any generative power and any possible relation of that trinity with the nature, which hardly reached the status of large estate of a Lord.

As far as his contemporaries, it does not seem coincidence that he maintained controversies with almost every of them. The luminous ring that discovered Boyle or Hooke soon turned the ring of Newton, and thus with almost everything. But known it is that what with Newton begins is, precisely, the scientific establishment and the manufacture of its prestige, and this so it was needed of unit as of the figure of a supreme pontiff, to whom he himself contributed with all his actions. The moment arrived in which, like with an absolute monarch, everything converged towards him, and in as much as everything moved away from Leibniz. Known it is that finally and at the limit, the very same Hanover employer of Lebniz was crowned king of England, to which something would contribute the genealogical vindications of the philosopher, in another one more of his forced servitudes and works; and that the new king forgot him completely for, among other things, not to bother Newton already at that time turned true institution.

The details of the biographical antithesis of the two great authors of the infinitesimal calculus, that even were born under the sky of opposed constellations, border the incredible, with infinitesimal aspects in all the modulation of their dialectics. They make recommendable the joint reading of both biographies, probably boring in themselves by separate. And it is that, at least by once, we had to be able to distinguish this deep polarity not only in the tree of the life, also in the tree of science: the polarity of disseminating and concentrating, the vegetative and the voluntary, the speculative and the speculator –the prolific, and the devouring.

57

It was not coincidence either that the islands were left behind in the development of the analysis with respect to the continent throughout the eighteen century and good part of the nineteen century, being adopted the notation of Newton instead of the Leibniz one. Leibniz found direct disciples in the Bernouilli brothers, initiating a line that would be continued with Daniel Bernouilli and the same Euler, whom among other things, developed the variational principles, the last and unavoidable form of modern dynamics. Lagrange boasted of having managed the dynamics doing without geometry entirely. Newton, we don't need to say, was the great reference for all of them.

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But with the Bernouilli and Euler another different branch of the analysis begins also, as separate of practical problems as possible: that in which the analytical techniques begin to approach questions relative to the number theory.

Leonhard Euler, in who seems that the spirit of Lebniz had concentrated itself with the only aim to make mathematics, found a formula that related in an exact way the infinite sum of all the natural numbers to the product of all the prime numbers: the famous Euler product formula. This it is a good example of something inconceivable that it simply turns out to be certain, and even relatively easy to demonstrate; and the decisive precedent of the analytical number theory, several generations of distance from its accomplishment. In spite of his achievements, the same Euler left written that the mysteries of the distribution of the prime numbers would be beyond the human understanding for ever.

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Gauss and Legendre did not have to think the same, around the change of century, specially the first, who was the one that gave greater impulse to the classic number theory, also called superior arithmetic: in fact, the single study of the implications of the Arithmetic. Nothing is so fundamental in mathematics, nor offers anything similar resistance and difficulties. Gauss gave the law of the global distribution of the primes in the form of logarithmic integral, which took a whole century for its proof. Some comprehensible law for the man was in the prime numbers, after all; today is called the Prime Number Theorem. And in spite of this great step, how little still which is known on the subject. The same prime number theorem only found its proof through something infinitely more enigmatic: the order that the prime numbers showed by analytical extension in the complex plane. Bernhard Riemann was the first man who saw that landscape.

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It is worth the trouble to stop a little while in the modern analytical number theory; the one that goes in direct line from Euler to Gauss, Dirichlet and Riemann. It is one of the great achievements of the human spirit, as surprising as the development of physics and surely with many degrees more of depth, but much less appreciated and known. An achievement that was not born from any type of urgency neither of hunting of the supposed secrets of the nature, but from the most incorruptible and free of the explorations. But the circumstances are not gratuitous. The space of the analysis tends to pulverize the objects, breaking them until infinity, or until is possible. The power of the analysis arises from the development of the series; but of all the series, none more natural than the one of the natural numbers, or the whole numbers, widen a little bit. As the pulverizing power of the analysis grew, particularly for which we called the dynamic space and the real space, the integrity of the whole numbers, its irreducible and discreet character, became involved in a completely new reluctance and charm. Already Leibniz –and this is quite significant- had appreciated all the importance of the

discrete mathematics, as he himself denominated it, with an ample synoptic vision of which now we called combinatorial analysis. And although barely he worked in number theory, nobody more indicated to conceive the new relation that was approached here. But Gauss sentenced it with his habitual straightforward style: the Arithmetic is the science of the time, just as geometry is the science of the space. For physics this affirmation cannot be falser. But physics not only has arisen from the mathematics, but in fact is applied mathematics. Within the mathematics the affirmation of Gauss will be unavoidable for ever. Geometry cannot separate of the given or empirical data; the Arithmetic yes, and as completely as can do it something under our scrutiny. It is more, it would be possible to say that it is the only point of the formal sciences in which the scrutiny of the own intellect is possible, -the self-observation-, no matter how hard this is prevented constantly by the very instrumental character of the techniques used.

The dynamic space of physics is equal to the analysis of geometric origin (algebra included) *minus* an infinitesimal part of the Arithmetic. This residual subtraction still prevents that we consider the physics like something empty, although soon we fill up it with the mistaken material. The filling is time in anyone of the cases. And it is possible to think that, in the same measure in which this remainder grew, the dynamic space with its ghosts would be contracted.

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It is not surprise that for some mathematicians the Riemann zeta function is the only scientific discovery worthy of respect and admiration: in comparison, the best achievements of physics are as magnificent as mature apples and equally vulgar. And it is that there are reasons to think that, being so strange its behaviour in respect to other kind of functions, has had to arise to crosscurrent of the habitual developments, is to say: like opposite current or reflux of the main current of the analysis.

The Riemann zeta function is classified between the special functions; and, within them, it plays the main paper in the Arithmetic and the series of the whole numbers, of which derive all the others. The whole numbers are generated by the most elementary of the operations, the addition of the unit. When we attend the products, we observe that some numbers can be decomposed in products of inferior numbers, and others not: they are the prime numbers, numbers only divisible by themselves and the unit. The order and sequence of these prime numbers has a global regularity –the logarithmic integral we alluded before-, but a local behaviour as random as it can be possible. Thus, the zeta function becomes the best known form in mathematics to unite these two antagonistic and apparently irreducible components. That is to say, we cannot know a bond between the order and the chance better defined and more fundamental than the one than already exhibits the whole numbers with their primes, and the Riemann zeta function is that bond. It is no wonder that such a bond has so endless ramifications.

62

From the very beginning of the calculus the theory of the probabilities begins to be developed; they are like the two faces of a same current. The apparent exactitude of certain laws and the same functions does not make but emphasize the possibilities of disorder for independent events. And it is that the function concept tends to become synonymous of dependency, and the probability, of disconnection or independence. Between both ends it can be all kind of combinations, and thus we found from probability functions to probability of a type of function within the space of the functional analysis. The analytical descriptions would be infinitely fragile if they did not tolerate all this counterpart of the theory of the probability, and this last one would not have been developed without the first. Therefore, they are as indivisible as different: from the point of view of the same process, it can be said with all property that they are complementary, although our understanding

tends to differentiate them as much as it can. A form different to consider the probability, and even the relations between necessity and probability, is the combinatorial analysis. One of the most remarkable peculiarities of Leibniz like mathematician and philosopher it is that he thinks in terms of differential analysis and combinatorial analysis almost simultaneously: exceptional characteristic that emphasizes the mathematical historian E. T. Bell, but that any reader can perceive in philosophical texts, sometimes disconcerted, and sometimes even with reluctance. It would be said that the human mind prefers to separate these two scopes in different compartments, to have more space jumping from one to the other. And what it is gained is, precisely, space: what is lost in this operation is the time.

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Not very often we considered that the unfolding of the thought of a person is an exhibition of the whole nature. And nevertheless we know it, although badly. For example, it is too easy for us to see other people like natural subjects, and we even found please in it; but one can not see oneself the same way. We alternate thus between two visions, without having barely the smaller sign of a complete frame for ourselves: the only one that could give a right perspective of the other people. The word "nature" is only a synonymous of that correct perspective or whole frame of the activity of a single entity; and we will say that that frame and that perspective are indistinguishable of its spirit and of the spirit –what it responds to the question of its continuity, that even it is not necessary to present.

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The Riemann zeta function allows for example to calculate the exact number of “prime numbers smaller than a given number”, whatever the number is; which already is miraculous enough having in account the purely random character of the primes in a concrete interval or proximity. But, only to arrive at this, which made the title and the apparent intention of the original Riemann’s writing, it is easy to suppose that the function must contain much more information than the one than it can give us in the limit of one of its transformations. Of course, it is not information which lack in the zeta function, but rather on the contrary: one would wish to reduce as much as possible. Which takes to the formulas again to generate the function, whose main disadvantage is to be more or less equally monolithic and without fissures than the own series of the numbers. This summarizes a little the class of difficulties that presents the problem of the famous “Riemann hypothesis”.

The Riemann hypothesis says that all the non-trivial zeros of the zeta function in the complex plane has a real part exactly equal to 1/2.This value is known like the critical line. The proof of the Gauss prime number theorem demanded that at least exist one critical strip between 0 and 1 as excluded values; what it is not something trivial either. The zeros of the zeta function and the prime numbers satisfy a certain duality through the spectrum and the harmonic frequencies; including these last summation formulas, the duality is not of irreducible character, and we also could speak about a ternary relation. And, really, it is just to say that these three aspects –prime numbers, summations and zeros- form an extraordinary triangle, open and in movement, with infinity of transformations between them and within. That’s to say, has a certain resemblance, in other dominion, to the open triangle of the *gunas* in the Samkhya.

It is assumed, on the other hand, that this critical line is the most synthetic part of the endless information of the function, and the easiest form to filter it. But, on the other hand, there are other many interesting questions, between which overhang the values of the imaginary part of the zeros, the height of this along the critical line: hardly anything is known on its correlation. These values of the imaginary part are related as well to the "periodic terms" of the function, as Riemann called them, in fact oscillating terms, that

play a very important role although often they are relegated to the background. Many very general relations although nothing clear with the harmonic analysis and the spectral and wave theory are derived from this feature.

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The zeta function has been generating more astonishment as have been made calculations on the non-trivial zeros, all which agree with the hypothesis till the moment. To this day, it has been verified on more than a trillion of zeros (10^{12}) without no counterexample. It is more, almost all the signs seem to indicate in the direction that this will continue being certain until numbers inconceivably more elevated, in which some of the aspects of the function alter their behaviour in relation to the interval of smaller numbers and, could, perhaps, generate some counterexample or refutation of the hypothesis. The truth is that, not to have the smaller idea of why the zeros must have real part 1/2, this behaviour is already extraordinary enough, even if someday a counterexample is find. At the moment, the critical line is there, without another ratio pretends that its own obstinate existence.

Like non mathematician, always has called my attention that the mathematicians who work in this so terribly difficult subject speak about to demonstrate or to refute the hypothesis, and that they speak about understand the function much less. I must suppose that they cherish the hope that a proof or a refutation of the hypothesis will also illuminate the understanding of the function almost automatically, but this hope seems to me unjustified; not to mention the automatic character of the illumination. But, to be fair with the mathematicians, it is necessary to say that they are the first who kindly explain to us that they do not understand the behaviour of the function; even they say to us that it is the most fundamental, elementary level, the one that is not understood. What it is not surprise, because that elementary level is not other one that the relation between additive and multiplicative properties, but taken altogether –globally- already from the very beginning. As it is easy to see, this is in intimate relation with the double aspect, differential and probabilistic, of the function; being the probabilistic part (taken "separately") based on the independent or additive relations, and being the differential part (taken "separately", and including the logarithmic decomposition in sum of products) based in the multiplicative and dependent relations. But the problem here is that there is no separation at all, because exactly what does the function is to combine all these elements of the most compact form, so that little more fits that to study the values that throw the arguments: what we call the "behaviour" of the function.

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Since the problem thus presented is so impenetrable and without fissures, it has been tried to give it the turn and to raise it the other way around: to try to imagine to what class of physical or dynamic behaviour could correspond the behaviour of the Riemann zeta function. Apparently, Hilbert and Pólya already raised the question at the light of the functional analysis and the operator theory then emergent, there for 1914.This only could begin to have some relation with the reality when that same theory of the operators found in the quantum mechanics a suitable field of applications; and even then there were the least evidence of relation. These dispersed evidences have been accumulated through the time. The history and the sequence are more or less well-known: Selberg gave some more explicit relations with the spectral theory; Gutzwiller made an approach in terms of periodic orbits for a semi-classical system with a Planck constant tending to zero, Montgomery settled down the similarity between the spacing and repulsion of the neighbours zeros and the distribution of the energy levels in the random matrices that are applied to problems of the interaction of many bodies or particles within the quantum mechanics. Only it was missed, since Berry did, to propose some type of quantum system that imitate the behaviour of the function; or, since Connes did, even to create a specific

operator with an equivalent behaviour. All this is extremely interesting, of course, but at the moment doesn't help much to understand the function itself: for which reason must have or not to have the zeros in the critical line, and even why they must have those particular values in the imaginary part.

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In spite of the enormous extension of the developed work, everything follows almost exactly just as in the beginning. Nevertheless, the relation with real dynamic systems, with physical systems, does not stop being another extraordinary fact more of this function, and one of the more unexpected. Because, what relation would have to have pure an arithmetical series, with its prime numbers and all the others, with real a physical system? And a quantum system, in particular. Well, after all, the quantum systems have indeed an irreducible discrete component, but nothing else. The relation that this could have with the prime numbers is completely conjectural. Perhaps, yes, the prime numbers can be related to resonance phenomena, in a somewhat similar way to how the rational numbers play an important role in the chaotic orbits of classic systems; but nothing of this is clear. The quantum systems, apart from that, are of wavy nature; in relation to the zeta function, the main difference they introduce with respect to classic wave dynamics is that they exhibit a much greater number of possible states. Therefore, it is possible to consider the zeta function in relation to dynamics in general, more than to the quantum mechanics in particular. Or rather, chaotic dynamics in general: that ample and diffuse field between the purely random behaviour and the determinist behaviour with stability. Thus, for example, thinks Michael Berry, who has suggested that the resolution of the Riemann hypothesis would provide to the analysis of chaotic systems something similar to the harmonic analysis for the more ordinary oscillators of physics. This would not be few; but nobody can suppose of what conditions it would have to start an analysis with such a power of resolution.

68

The connections of such a hermetic object as the zeta function with dynamics are encouraging and stimulating, but, simultaneously, potentially misleading. Speaking so much of operators and other tools applicable to the physics, one forgets for a while that is trying to understand a purely arithmetic "object". And I write object in quotation commas because it does not seem to me suitable at all to the arithmetic dominion, which, as we noticed before, is the more refined dominion of the time that we can put under our scrutiny or analysis.

Let us think about that even it is impossible to say if the infinite series of the numbers is something open or closed; and obviously I do not talk about the potential infinity of its enumeration, but to the possible relations. What it would take us now to semantic questions only; the mathematicians settle in their way defining the set like an abelian semi-group with double structure of total order (additive) and special order (divisibility).This is a simple characterization that does not limit almost anything either. The perfectly trivial fact that the function has its singular pole in the unit always makes think about the predominance in a certain sense of the total order: in the indefinite repetition of the same conditions, that entails the other order. There is no need to say that with this one does not go anywhere, but, in any case, to consider that the function in all its immensity exists there just like that, take us to that position half platonic and half empirical that conforms the more external and instrumental aspect the mathematics, and of the physics and our view of the world in general.

In any case, it seems evident that the confirmation of the hypothesis imposes the simplest of the behaviours, and that its refutation would render a more complex behaviour: but of this it is not followed automatically that its certification makes more tractable or compressible the relations and complex aspects of the series. That is to say, also it can imply the opposite, that it is that in the critical line all the circumvolutions

of the plot are stretched to the maximum and no longer is possible their later reduction. In other words, exactly the critical line would be the most impenetrable. This seems well compatible with the nature of the function, which again takes to think to us that a greater understanding of this one –the function only- would be more desirable, ignoring the hypothesis as much as were possible. And this was what Riemann did.

69

Bernhard Riemann was a man with a special capacity to receive. That is to say, he had that we call receptivity in a very high degree. What is worthy of remark, because remembers to us that for some important things it is not enough with the mere intelligence, the avidity or the ambition; whole generations of Newtons not even had smelled this subject starting off of their own initiative. As sure as we can be that he worked much in the manipulations and transformations of the function, we can be sure also that at no moment he considered this subject as the hunting of the white whale. What he had to look for at any moment was a union as solid and indissoluble as possible of two apparently dichotomizing behaviours. And that search and effort are exactly its creation; because what emerged soon through it surely surpassed his expectations. But what Euler and Riemann united for ever with as much care as fortune, now we want to disassemble in pieces like an artefact.

Known is that Riemann also concentrated all its forces in physics and the philosophy, and that both concerned so much or more to him or more than his own mathematics. Shortly before its communication on number theory, he had already elaborated a mathematically very refined theory on the electromagnetism, which finally he preferred not to publish. As far as the philosophy, only we have had left dispersed fragments, and, although perhaps living some more years he had been able to distil them, the certain thing is that we can have more than doubts on that possibility: the verbal and written expression displeased too much to him, for which he had very little ease. Nobody can be everything simultaneously, and in the case of Riemann the physicist and the potential philosopher had to suffer the personal pre-eminence of the pure mathematical thought. But, with his analytical qualities, so much predominated in him the concentration and synthesis spirit, that in the end almost nothing was lost: Riemann is not only the deepest of all the mathematicians, is also the one of deeper implications for the physics and the philosophy; because both things only can go hand with hand.

70

We said before that the similarity of the behaviour of the zeta function with certain dynamic systems can be very misleading, and that is preferable to always have in mind its arithmetical nature –purely temporal-, by more stimulating than the associations can be. But we have here to introduce a turn that could only be unexpected for those who ignore everything said yet.

We have seen that the dynamic systems, already from the same Galileo, make a selection of the reference frame with preference for the inertia; this means that the space itself, or the points in rest do not have any sense and that is the movement what determines them. This means that the previous positions simply disappear, absorbed in the momentary dynamic state of the system; this is what we understand by dynamic space, of which is implied that it introduces an irreducible temporary element, although in fact does not make another thing that to geometrize the movement, which is completely different and even rather the opposite thing.

Nothing of this happens in a complete arithmetical series: here the relative positions of each one of the elements are not lost nor vanish, as much they can be numerable. Exactly this is considered like the “timeless character” of the numbers, the property that makes of the mathematics the instrument of proof more self-sufficient and trustworthy. For me it is rather the opposite: that nothing here –numbers as such- lose its position nor vanish is what guarantees that we are in time itself as it is, unlike a dynamic system that defines

the instantaneous cutting it out from all the other as if it had scissors.

And in fact, a quantum system tends to vanish a good part of which we consider a classical dynamic system; in particular, it dilutes the badly called "causality principle" of such systems, that on the other hand shines by its absence and only talks about the global synchronization principle, the "scissors" of the present moment and the momentary state of the system. Nevertheless, it continues being a proper dynamic system, in the sense that the conservation principles are applied and presumed. This way, the characterization of the quantum mechanics in purely dynamic terms is, as it could not be less, irreducibly ambiguous. And the duplicity between the local connections –with finite speeds- and non local connections –simultaneous- it is practically impossible to treat: they can be contemplated alternatively, but not simultaneously in a single form. We can say then that a quantum system is dynamic, but much less than the classic ones: in all the senses, and even although here there is apparently much more fluctuation and movement. It is by this that the connection of a quantum system with an arithmetical function seems less surprising: in as much in which there is less dynamic element there is more temporal element. It is natural and logical, even being very far still of particular or explicit relations. Something similar can be said of chaotic systems, even being these of very different nature. Some of the algorithms used right now to explore the zeta function are highly similar to those for the problems of chaotic orbits for many bodies in classic dynamics, which sends us to the pioneering approaches of Gutzwiller in that direction.

Time emerges in as much we do without the cut and the selection of dynamics. It is good for recognizing it, even when it does not make the things easier to us.

71

This anomaly with respect to any known dynamic system begins to be perceived when physicists and mathematicians try to define the supposed operator that would underlie to "the zeta function dynamics", that some even call "Riemann dynamics" to be brief. It is said, for example, that the zeros have the same statistical properties that the energy levels or eigenvalues of a "non-integrable Hamiltonian not time-reversal invariant, with not known variables", and quite similar things. Any characterization that we could find in the Literature of the subject will not be more precise. Yet, "external" properties like those that Berry remarks are worthy of interest: chaotic, unstable dynamics but with boundaries, instability of homogenous character, quasi-one-dimensional dynamic. But, when we want to tie all these ends, it is quite clear that we do not know any dynamic system like that.

72

Voronin gave a universality theorem with respect to the zeta function in which it demonstrated that, assigning codes to the numerical information of the same one, the function contained any amount of information and formal knowledge that the human kind can reach, repeated infinite times, and with any arbitrary degree of precision. Mathematics contains other seemed monsters, like the fractals: but these are not infinitely differentiable nor talk about something as fundamental as the series of the whole numbers.

Even not liking this type of generalizations too empty always, we can use it to imagine another perspective: let us imagine this apparent universe, whatever is its dimension, with all the states of its particles, throughout anyone of its possible times of evolution. Could be described all these states within the zeta function? Yes, naturally, according to the Voronin theorem. Now, we try to think a universe with a pre-Galilean dynamics, if it is that it is possible and it has some sense. I am afraid much that it does not have it, and that a "pre-Galilean dynamics" without inertial frame of reference or relativity, aside from not existing, not even could consider particles in our terms; but this now does not matter, is only a vague mental experiment. In that universe of the here called pre-Galilean dynamics, any previous state of the system does

not disappear, and continues adding itself to the successive states without we know if it can affect them in something or not. This way, we would have an apparent inflation of information. However, we imagine that this pre-dynamic universe, still much more inflated of states that the universe of familiar dynamics, we had it to compress in a line or dimension, that is to say, in a quasi-one-dimensional system. Would it fit still? Surely yes, and the zeta function would keep a good degree of similarity with it. And to where the space would have gone if all the codifications of the space can be ordered in a line or an almost one-dimensional set? Of course, I am not willing to respond to these somewhat waif questions, that, I am afraid, also reflect partly our waif idea of the time, the things and the cosmos. Nor I believe that it never could be much compatibility between dynamical frames and pre-dynamical or post-dynamical frames.

73

As far as the characterization of an underlying operator to the zeta function in terms of its Hamiltonian, the Hilbert spaces, the renormalization group and so on, this is so general and misleading as to speak in dynamics terms. And nevertheless, yes, it can be very fruitful, and that is at the moment what matters. I believe that even it is absolutely necessary to consider the analogy with dynamics with as much rigor as possible, because perhaps another way does not exist of which we begin to conceive the limits of dynamics; limits that right now are inconceivable to us.

For me, the Hamiltonian only means here that the principle of least action, or extreme action if is preferred, is present. But in the first part already we considered the hypothetical possibility to apply this principle to mixed systems of a special class, of which the pulse was a good example, which tolerates friction and certain compressibility. That is to say, we considered the principle of least action in an ampler sense than the one of dynamics or mechanics; a sense very similar to the one that Lebniz could have in mind for its system of the nature. Known it is that the leibnizian system was denominated "dynamism" by the secondary role that had inertia and the inertial frame in it, that is to say, by the few that it had to do with which now we called dynamics. And known it is also that he tried to generalize the principle of least action or of the optimal paths to the economy of the monad and the organized parts of its aspects or substances –body, thought, etc -. That we called before pre or post-Galilean dynamics would not be another thing that the Lebnizian dynamism, that, on the other hand, does not let seem to us excessively baroque.

It is the critical line of the zeta function an extreme line or a line of least action for the union of the differentials and stochastic aspects of the function? Perhaps it could be spoken thus, if we distance of the merely dynamic interpretation of the variational principle. This one is always ampler than anyone of its physical interpretations.

A distinctive seal of the reduced work of Riemann is its unit. On the matter, Weyl said that, precisely in the work of Riemann, and more than with any other mathematician, it was necessary to consider its unit. Unit that apart from that is too implicit and cryptic, with ample space for the speculations. From his first great works in complex variable, there on 1851, Riemann was based in the variational principles of the theory of the potential; in the called by him “Dirichlet principle”, that Gauss and Green already had used, and that so many headaches gave to him. The same Dirichlet, mentor and teacher of Riemann, worked as much in the theory of the potential as in number theory. Between Leibniz, Euler and Riemann there is a kind of continuity like the one that can be between Newton, Maxwell and Einstein; a powerful and persistent continuity, in spite of the great differences that the evolution of the main subject marks.

74

The Riemann zeta function is the mother of a whole family of functions, the automorphic L-functions,

derived from the Dirichlet L-series. A distinctive feature of all them is to have its own critical line, on which also extended conjectures have been made of the same nature that the one of the zeta function. This one remains like the fundamental by its more direct and general connection with the series of the whole numbers.

Not to delay me more, I will say that the idea which I have in mind is that the study of the time series of the pulse and its inside-out dual behaviour can help us to understand *some of the aspects* of the zeta function and its associate functions; aspects that at the moment do not seem to be contemplated neither by the different branches of the number theory, nor by the alternative dynamic interpretations, and that could be very important. What it is very different to construct a system *ad hoc* to try to replicate the behaviour of the function. The function is enormous, and what we want is to isolate some small, but decisive, distinctive aspects.

We must remark this, because we are not speaking of which the pulse and the function are similar things. The pulse and its dual correlation can and must be studied perfectly in a totally independent way, with their own and simpler tools of analysis; but the approach to the zeta function, with all that could imply, really needs other references in addition to those better known at the present.

I cannot hope that everybody take seriously the possibilities of this connection, although equally unexpected connections in other areas of dynamics have changed the mentality on the subject remarkably. The relations that at first sight we can establish between both fields are, of course, somewhat vague and accidental: the dual character of the behaviour of pulse, still entirely unexplored; its mixed character with regard to the discreet and continuous series, as well as to the conservatives and dissipative aspects, etc. Also we could speculate about the tendency to the repulsion in the fluctuations, and some other analogous signatures, but these simply enumerated would have to be sufficient, at least for some people, that look for an operator with properties and variables extremely ambiguous, if not contradictory. And if we are sent to the obviousness that the pulse is a temporal series, we say that it is so in a much more specific sense that what by "temporal series" it is usually understood, that is to say, an empirical series with its continuous or discreet spectrum. Truly, I would say that the pulse has more arithmetical nature than anyone of the dynamic systems that we contemplate, whereas we contemplate from the perspective of the dynamics; and by the same I will say, if it is allowed me, that this type of approach not only is not preposterous, but maybe purer and more natural than those dynamical approaches, and even than many of the strictly mathematical approaches. In the zeta function, the extremely delicate balance between global order and fluctuations are not only important, but fundamental; in fact some of the approaches with more interesting potential applications are referred the theory of the stability.

Evidently, the very uncertain and not already defined duality of the pulse has nothing to do in principle with the very certain duality of the function, but, allowing a kind of reference for the fluctuations, would have to show finally its connections with the other problem. I recognize that an immense dose of faith in pure mathematics plus an equally immense dose of faith in applied mathematics is needed to believe in this possibility. I don't know if people such exist in this world, but, in any case, to them is addressed this writing in first instance. But the concepts are, though incomplete, very natural, and worth being explored.

We start from the undivided, monadic character of the Riemann zeta. But this not implies that it is absolutely intractable. Unlike the atom, a monad cannot be split; but a monad breaths, that's the miracle. Like almost all the dualities of the analysis, the one of the pulse is not irreducible at all, but a comparison term with a vast ground within. And, in as much we cannot "crack" the function, we will find more and better signatures of this breathing. Naturally, in mathematics we only can find this breathing in the form of pure relations, but even so, there is something more than a metaphor here.

A monad is pure activity, exactly like mathematics; pure activity, but not pure act. Probably, those who want to crack the zeta function believe much more in the platonic heaven than us. Moreover, they could believe in an empirical platonic heaven –a very strange place, indeed, though a grain familiar.

If we say that the pulse has more arithmetical nature than anyone of the usual dynamical systems, which here is allude is its cumulative character, as doubtless as the one of the set of the whole numbers, and with more than one similar difficulty. It could even be postulated that each new cycle of the pulse introduces newness necessarily, but, naturally, only in the continuous dominion could find this its reflection. On the other hand, it is or certain that we found logarithmic scales or spirals in the same organic rate of development, growth and aging, and even the same experience of the time with the pace of the years: in those hours and days that for the babe seems to be limitless, and that so fleeting became with time itself for the elders –and more for the late ancients, one could think. The same logarithmic law of Weber-Fechner –both colleagues of Riemann- which relates very generally the excitation and the stimulus, have a strong although yet indefinite connection with this. In the pulse it is also present, in addition, a "critical line" that allows us to distinguish the degree of inexorability of this general tendency, that is to say: the proper degree of reversibility or irreversibility of the modifications in course. And again, *prakriti* and *vikriti* are the only criterion and frame of reference to settle this question. Without the refinement of this criterion, whose limits is absolutely compelling to know, aside from what revealing can be in themselves, any other form to measure the degradation or entropy, the disorder or the aging of an organism, will be so sophisticated technically as absurdly primitive in concept.

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So perhaps we don't need to construct a complicated device to imitate some essential characteristics of the famous zeta function, and have these and others either to our disposition; in order to realize strictly this it is necessary to deepen with sufficient well-taken care and rigor in the experimental study of the pulse. To understand the nature of its variational principle, quite a lot ampler than what it is understood as such, but also rather more explicit from the causal point of view –if we understand causality like the ordering and sequence of the fluctuations.

One of the many important questions that there would be to limit is the least time interval for a fluctuation. Or in other words, what minimum interval we need to define the sensitivity of the system within the potential of *tridosha*, or, *vata*, that comes already given in irregularity terms. In addition, this interval can admit different readings according to takes the pulse in one of the wrists or considering the correlation between both.

Not even we will try to enumerate the most important points that it must require this study, because only in the experimental arena could they highlight. We will only say the following. If some dream about an analyzer of complex or chaotic dynamics based on the zeta function in the style that Berry suggest, they can be sure that any temporal series of this class cannot be reduced to other smaller elements than the ones corresponding to the fluctuations of the *tridosha* in the pulse with its specific variational dynamics. This would be the limit of "spectral resolution" and of the compressibility also. But this limit would be a big theme itself.

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Some could ask to us what could have this to do with the basic physics. The answer could be: "Nothing, neither we need it at all. A complex or emergent system does not have why to have explicit relations with the fundamental physics, except for the elementarily indispensable ones." Thus we would avoid problems. Nevertheless, it is something annoying always to leave the things in the air, particularly if we can go further and demanding it the conclusive character of the subject. Apart from that, also the relation between quantum systems and prime numbers remains like an absolute mystery.

Of course that our theme does not seem to have too many connections with the more spread vision of the mainstream physics; mainly, when it is considered that this one hardly has any vision, but a good bunch of equations. Leaving this aside, we will make an effort to locate the subject closer to the area of problems of the

physics in its historical development and present state.

78

Since Newton we have the problem of the vacuum in physics. Namely, that in an inertial frame with forces, like his, the emptiness or the vacuum cannot exist, neither an ether-like medium. Known it is that own Newton researched with regular intermittence the dynamic possibilities of the ether, already from the first years, returning in addition on the subject in the last years, with successive editions of the *Optics*; and that never could settle the question.

The ether or universal medium counts with a long history of illustrious attempts to describe it: aside of those of Newton, we have the own Euler, who gave us a hydrostatic and almost Archimedean version of the same one for the gravity, and Riemann, and Poincaré. Einstein was neither convinced at all about having eliminated its necessity, except for his own formulas, and Leibniz spoke of *a plenum* like a medium, but still more intractable than the one of the other mentioned proposals. As it is seen, the problem of the medium has enjoyed an enormous attractive and prestige, particularly between the greatest mathematicians. At this sight, that today we tend to forget, it is more surprising the sufficiency whereupon we judged the subject, mainly if we notice we are not better than before. It is not only that now we have scalar fields for the masses of particles, the inflationary model and even for the fluctuations of the phantom cosmological constant, not to mention the polarization of the vacuum and the energy of the fundamental level, the so called zero point. No; all this is or phenomenology or complementation of the present discoveries. To which we talked about is to the point aimed in the beginning, that modern dynamics excludes by definition as much the medium as the real vacuum, so that only can choose between a false ether and a vacuum equally false. Of course, it always shows preference for this last one, because it can measure it at least and consider it in terms of fields and forces.

And to crown it all, the universal medium is made absolutely unnecessary when we have established an absolute time from the beginning, that invisible and arbitrary "universal synchronizer". But this one it is still more undetectable than any ether –it is absolutely undetectable. Thus, we could reverse the question with great advantage for the measurement and the experimentation: in as much in which a universal medium or ether exist, the absolute time or universal synchronizer is unnecessary. Then, the immediate form to characterize the ether would be time itself.

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Something similar was what Nikolay Kozyrev thought –Kozyrev, maybe the most original experimenter since the times of Galileo. Kozyrev and his team at Pulkovo already made in the Fifties all type of experiments with pendulums and torsion balances in order to measure distortions of the force of the gravity. They regularly measured them repeatedly and with enough homogeneity, although this class of experiments are highly dependent of some circumstances. Naturally, the mainstream physicists are not willing to consider neither the experimental results, nor the philosophy and ideas on which they were based.

Kozyrev conceived the time like a flow in four dimensions with an additional constant equivalent to a "causal speed". Apart from to exist space between causes and effects like in dynamics, also time intervals had to exist not arbitrarily small. Kozyrev made in addition considerable efforts to harmonize its theory with the structure and data of the relativity and quantum mechanics, with which it is quite compatible. Great part of all this lead to the problem of fitting the non-local factors and the simultaneity with the finite speeds that relativity –and the vacuum- imposes; but all this from the perspective of which the classic mechanics has an "infinite causal speed", and the quantum mechanics, a causal speed equal to zero. That is to say, a brilliant reversion of the problem, complemented with the only conditional conservation of the angular moment.

The time in Kozyrev is not the time absolutely passive and special of dynamics; it is an active time

with an own density that imposes a course and a directionality, aside from specifying the causality. The problem is that Kozyrev seems again to reduce the time and its flow to a new constant, or a more or less linear variable. The same title of his first introduction of the subject says it openly: “Causal or Nonsymmetrical Mechanics in Linear Approximation”. In addition, after giving axiomatic rank to the necessity of time intervals between causes, seems to ignore any time interval between the action and reaction, which establishes divisions in his own criterion. Like a pioneer, Kozyrev only could be fragmentary; but even so is the first introducer of the problem of the real time within physics, with alternatives to the vanished ghost of the dynamics.

Kozyrev does not get to consider of a theoretically convincing way to what extent the density of the time affects or governs to the constants of the fundamental forces; although from its own experiments its variability comes to be deduced. This, that even today seems absolutely incompatible with the modern physics in all the extension of its predictive apparatus, would not have to be so scandalous to us: the so called “constants” of the coupling forces in the standard model are dependent of the energy, and by the same, variables. We do not know why reason this would not have to apply for the gravity.

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Zhvirblis, one of the continuators of the legacy of Kozyrev, shows the example of the of Lazarev’s koltsar; a vessel closed in a ring form with a porous separation, which exhibits a more or less identical behaviour to a superconducting ring, with a continuous circulation of the content. As Zhvirblis says, the Lazarev’s koltsar is not an experimental artefact at all, but rather an evident proof of the difference that there is between a real thermodynamic system and the ideal systems without structure contemplated by the classic thermodynamics maintained near the thermal equilibrium.

A real thermodynamic system as a koltsar it is a meta-stable system far from equilibrium; that is to say, it can never stop. The meta-stability is derived as well from the bi-stable character of the simplest structures, and descending to the quantum world, we see that the single electron of the molecular hydrogen H2 cannot be coupled to only one of the protons, but that move continuously to belong to both. The same type of interchange occurs in the Cooper pairs in a superconducting material, so similar in this to a koltsar, and moving away of the thermodynamic model; nor has to say that superconductivity is a phenomenon still very poorly well-known, in spite of the intensive effort developed in this field.

Since Lazarev’s koltsar is inadequate for a quantitative control of the circulation, Zhvirblis proposes a vessel with osmotic barrier, in which the thermodynamic demon of koltsar with its associate paradoxes can be studied better.

In Lazarev’s koltsar not only *may* be, but *must* be circulation, because of the very existence of both different stationary states. The energy released in the movement is not of trivial origin; it is not followed from the laws of Raoult and Van´t Hooff, “*rather appears like a ghost*”. Zhvirblis says that it is as if something had lost or had let without say in "some pre-axiomatic level". "*the circulation appears not to obtain the balance, but by the two different stationary states that appear by virtue of the interaction of physical forces"*. The origin of those forces is not considered at all and it is assumed as understood like a "*perfectly obvious* "physical reality. Zhvirblis says this so apparently trivial that we have applied in the very different context of the duality of the pulse: *"When two conditions cannot be satisfied simultaneously, the circulation occurs”.*

Zhvirblis ends up concluding that the problem of the irreversibility is an illusion:"*the thermodynamic reversibility is inferred from the reversibility of the mechanics as it is applied to a koltsar or to the meta-stable structures. Correspondingly, the irreversibility of the thermodynamics can be inferred from the mechanics only if the last one is postulated like irreversible, that is what Kozyrev did.*"

The question is that the koltsar will remain an open system, independently of how much we want to isolate it. And any other object that we consider, if we know to appreciate its fluctuations. Zhvirblis shows different electrical devices to us from which can be deduced a similar behaviour. The author concludes that any real object is meta-stable and only can maintain a defined structure in as much interchanges energy with the environment "*This interchange not necessarily manifest transformations, but in the bi-stable systems, with*

circulation, cause processes accompanied by useful work."

That is to say, if reversible behaviours exist, it will be thanks to a determined structure of interchange with the medium, and not by the grace of the mathematical formalism. However, what is what fluctuates in all this interchange? Is it energy, or rather the energy and the movement are their manifestations? These questions always have been considered insoluble; but exactly when arriving here, and if really we had some new right to speak about the causality, we could to reframe the question entirely. A koltsar is not but a kind of monad, and we have many of them to study properly.

81

"*With each thought, something invisible, super-substantial enters our spirit."* Words that one would wish that entered more than one spirit like something more than ideas. The phrase is not from Rilke, but from Riemann, that left them pointed in one of its outlines for a psycho-physic theory. By the way that he was not making poetry, but that tried a mathematical and technical definition of how that happens. At the moment, few would be able to take seriously these theories; but like everything what Riemann left to us, the phrase has infinity of resonances, and they are not exhausted in the physical interpretations. Of course, Riemann is thinking about a kind of breath.

The preoccupation of Riemann by the general statute of the physics was not precisely a pastime of its free short whiles like mathematician. As some know, he worked much in a theory of the ether in which an influence or flow of the medium to the interior of the particle took place, just vanishing then; in this also he followed the track of Leibniz and Euler, trying to refine arguments, although much more explicitly speaks about Newton like model. But Riemann knows perfectly where it is: "*the inertia is the hypothesis*... ", and certainly there is not in physics another hypothesis that the inertia from Copernicus and Galileo, being Newton the one that isolates it of any other possible influence.

Models of flow inside-out of the particle have been continued reproducing until the coming of the quantum electrodynamics. The same Feynman worked in one of them with Wheeler, two years before giving the version that now has become standard; and still today there are physicists who continue defending it. The question is not that it cannot work, the question is that within the inertial frame this is ignored by unnecessary.

82

There is no harm in remembering the place than Riemann occupies in modern mathematics and physics. As far as the mathematics, it is not difficult to see that he is the main inflection point with respect to the old one, based in computations and algorithmic; that is to say, he is the main introducer of the present conceptual style, generalizing whole masses of concepts so to speak at bird's eye. He is in the same beginning of the unfolding of the topology, as well as of the set theory, that by many years the same Cantor also called "theory of the varieties". Being his style not inclined to put algebra in first plane, all his work on varieties and surfaces are pregnant to the maximum of algebraic implications. The signature he left in the complex variable and the real variable, establishing the bridge for all the modern theories of integration, is simply inescapable. But all these achievements are concentrated and enormously surpassed by that small communication on the prime numbers given to the Berlin Academy of Science. This it is the only writing that does not contain a single geometric idea of an author that like geometrician remained to the posterity; after that writing, Riemann, just at his thirty three years, no longer produced nor published anything.

The contribution of Riemann to the physics is critical and delicately strategic. Known it is the Riemann tensor, consubstantial with the general theory of relativity and relativistic cosmology. It is quite worthy of interest the fact that the Riemann tensor can be decomposed in other two: the Ricci and Weyl

tensors, which respectively measure the change of initial volume and the tidal distortion. These two tensors are theoretically separated, but in fact they can be intermingled and to be affected mutually, showing within the line of evolution or direction of the cosmological space-time some suggestive analogies to us with other potential dualities of the same zeta function, that here we only can aim. Also we have the sphere of Riemann, to determine the possible states of a particle of spin ½, as it is the case of electrons, protons and neutrons –all the "ordinary matter". That is to say, we spoke of objects with a minimum of two distinguishable states; in addition this would take to consider the transition from the angular moment of particles, defined in the complex plane, to the angular moment of the classic level of description. Known it is that some of the probabilistic interpretations of the zeta function become in the simplest terms of the "fair coin" with a probability of ½; the electrons and the other particles would be other many fair coins here…

A good reason exists not to believe in the possibility of a probabilistic demonstration: that the random aspect of the zeta function is only half of the subject, and that a half arbitrarily taken can never decide on a set arisen from more precise and ampler conditions simultaneously.

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Riemann could not introduce the ether –medium and substance more temporal than spatial- in physics because this one already was born without leaving space for it; but, in turn, we can say that he discovered an ether of mathematical or numerical nature. In effect, it is possible to speak in a certain sense of a "numerical ether", in a way similar to how the engineers speak the ether of frequencies. Nevertheless, this numerical ether is something quite different of the so called "Cantor dust", and even almost the opposite: it is so infinitely bounded that it must find at any place a vent or a free line of action. To the critical line would correspond this role.

84

The curse of physics has depended in an evident way on the mathematical techniques available. A spectacular example of this is the role played by the harmonic analysis in the quantum mechanics; to such an extent, that one never knows at all if the limits that are attributed to it as inherent are really of experimental or technical nature, being both so united aspects. The same Planck's constant, the quantum of action, is not simply an energy per second, but an energy per cycle per second –the cycle is generally missing. And, naturally, it can be said the same for the Heisenberg's uncertainty limit, that it is not more than a technical limit of the spectral analysis. This way the frequency, the most purely temporal phenomenon, is emptied of any content and become a mere integrant part of the formulas. What is here what turns? Why it turns? These questions are considered the cusp of the absurd or the nonsense, but the physicists do not give much better answers: "what oscillates it is an oscillator" (may be a particle), "and what vibrates, it is a vibrator". Of the cycle, like of the circle, we have learned how round it is, and that is everything; but think for a moment that we are speaking of a dominion –the quantum mechanics- in which the temporal series find their apotheosis. And in this dominion, the time is what shines by its absence.

We can obtain resolutions of phase greater than the ones of the spectral analysis by means of different types of phase-sensible frequency meters, some of them are so common that they are in the colour televisions. It does not seem to have another technical limit that the noise, and would be very interesting to consider under what assumptions and conditions could be useful this class of information. If a cycle is something more than a mere unit, we would have to be able to ask if it is not possible or necessary a tri-modal definition of the quantum of action, which already seems justified since its initial definition: work per cycle per time.

While I am writing this I see a rainbow by the window, and I think that the mere phenomenon of the colour is absolutely impossible without breathing itself, that colour itself it is already a breath that penetrates

without limit until the deepest. And I think, also, that in spite of the magnificent spectral theory, we do not know much about the colour. The Planck's constant is an integral, and if we could understand the fine structure constant in appropriate terms of time, we would understand to what extent the spectral analysis put limits to us. This is also intimately related to the Riemann zeta, whose zeros have been wanted to relate to the zero point of the fundamental energy level. But the zero point, besides the vacuum, would be also absolute darkness.

Any cycle must involve something, of course. A cycle is not but another word for which in other contexts we denominated circulation: that what occurs when two conditions cannot be satisfied simultaneously, as Zhvirblis remembered to us. And the interval that mediates between an absorption and a emission, seems that it would have to be decisive to discern between local and non-local action, that, in the same way that a wave and a particle, are temporally excluded and do not manifest simultaneously.

It is said that someone asked Einstein near the end of his life, when the quantum electrodynamics already had been established, what was what he would like more to understand. The answer was that he would like to understand a single electron. The modern theories of fields have an extraordinary predictive reach, to such an extent that the understanding seems to have made unnecessary. Of course, it is certain that we do not understand a single electron, and in this respect to speak about the vacuum would not improve the things precisely. What is what fluctuates? "What fluctuates, it is a fluctuator". And what operates, an operator; naturally.

85

Gradually, physics has been approaching number theory and Arithmetic. Some researchers still apart from the mainstream, like Pitkanen or Volovich, already put it in the centre of their considerations. It is even spoken already about the number theory like the ultimate physics; and here, "ultimate" would have to be understood simultaneously it in the double sense of last and inevitable in the development of the facts and first by its irreducible character. As we say, this seems to be quite far of the mainstream and its daily agenda; but, as it is observed with Connes's developments and non-commutative geometry, it is quite logic to jump from the algebraic aspects of the topology and differential geometry to the algebraic theory of number fields, to where it seems that the incompatibilities would find its last instance.

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In the same way which the zeta function cannot be understood like a simple partition function, we must understand that the correlation that we can measure in the pulse it is not born from a mere division of the whole system. It is not trivial precisely because it is not a division at all. We have already said that the dualities we speak about are not irreducible, but only terms of a balance that presupposes a mean to be defined. Without this mean, not even there would be possibility of translations neither of transformation of terms –no breath at all. That is to say, considered from a ternary point of view they involve necessarily TIME, a real time, us much real for us as the time of computation, no matter how hard the purely abstract time could remain unaffected. What allows us to make a curious reflection. As it is known, the principle of the global synchronizer in the relativity and the theories of fields depends on an imaginary time against which the "real time" stands out; that is to say, the order principle depends on a non ordered set of numbers. With this peculiar circumstance few can be done since the point of view of dynamics. But a similar circumstance yes admits an inside-out reversion in the same Arithmetic, in the zeta function for example, so that we can consider the time of computation that consume the different types of transformations of the function, the precision in the imaginary part of the zeros and any other aspect. That is to say, we can make an algorithmic approach assuming different computation algorithms and translating them in terms of synchrony and real and virtual

time; approach that has extraordinarily interesting possibilities and that here only we can leave aimed. Even the most intractable aspects because of the same magnitude of the numbers, moments and intervals, must find significant correlates in term of computation time and number of operations involved. This way we can generate infinity of functions with totally new characteristics around the main function and its critical line. The same criterion for the time of computation and the algorithms already is a great subject itself, but, in any case, which is within this function, given its nature, also has to be outside, and the more direct is the mode of translation, more will be thus. We believe that this kind of approach is the most straightforward, even involving many concentric and eccentric spheres. On the other hand, it would be great irony that the old algorithmic approaches had seen in the length of the computations the main obstacle, instead of the real path, and that those who are the whole day making computations had not evaluate the value of the number of his own operations. May be, finally, we begin to take seriously the idea that all this has to do with the time and the activity in the most direct way possible. Only in as much we renounce to the idea that we are in front of an object, the real thing will become for us a thread. The zeta function always impels to us to entirely reframe the analysis in the measure of our capacity, thus revealing itself more useful than any possible utility.

If we spoke before with regard to the hydrodynamics about the internal energy of the system like a third relevant element, is necessary to realize that, in terms of the *tridosha*, *vata* penetrates into the most internal, without being for that reason separated of the medium or environment. From here arises a sort of "automorphism" that we have denominated monadic. The question of the compressibility or incompressibility of the variations throughout the time arises, also –what it is the less abstract of the questions, since is intimately associate with the reversibility or reestablishment of the organic balance or its irreversible deterioration. In these conditions, any real system, that is to say, any complex one, must have its own line of specific temporal cancellations, well different from the cancellations that appear, for example, in the field theories. Otherwise, it would only be a fugue or escape line for three arbitrary principles, which is not the case.

And thus, the critical line of an entity, its union of *prakriti* and *vikriti*, to speak in terms of the Samkhya and the Ayurveda, far from being an escape line, is the subtlest and intimate axis of its breathing, its unfolding and its destiny. The monad is indivisible, but not unconditional. All what exists is breathing. A monad is analysis plus breathing, and then, we naturally enter the Samkhya dominion. The zeta function could be the most unconditional of the entities or monads, but even so, it is possible that it must remain necessarily open, and perhaps only thus can be related to the contingency, if not threaded with it. This mode, perhaps all real system are related to zeta of the most intimate form; but, in any case, more than to worry about this, there is to try to conceive the real systems in its purer temporal form. The zeta function seems to breath in the unlimited; if someone could close this unlimited breathing in a closed field, may be all the things would not breath anymore.

Don't we need hazard in order to breath, by any chance?

87

It is said that David Hilbert asserted anytime that the Riemann hypothesis was not the most important question of the mathematics, but just the most important question. Assert that we don't need to agree with, but that seems perfectly comprehensible and justifiable within the microcosm of the scientific mentality, and not only the mathematical one. Because the world would be equally mysterious without the famous function, but the coincidence is that the same function also seems to be inherent to the world, and from here all its wonder and interest. Independently of the hypotheses, the achievements of Euler and Riemann are absolute achievements of its kind.

The experience seems that it is showing to us, and will still show more, that it is much more viable to subsume behaviours within the zeta function than to derive this one from other areas and objects. And thus it has to be, if we admitted the fundamental character of the Arithmetic. In fact, it seems easier that this one fits

the nuts to all the algebra, the geometry and the analysis, than on the contrary; nevertheless it is natural and necessary that these three adjust and readjust around the big subject as the only possible form of becoming aware. It happens here exactly just like it happens to the *gunas* in relation to *Purusha* within the Samkhya, and here the comparison is not a metaphor.

The problem is what class of things we try to subsume, and how. We have already seen that here the greater obstacle is precisely the common meaning of dynamics with its systematic evasion of the temporality and its equally systematic substitution.

We have tried to show that the zeta function is not simply a challenge for the analysis and the analysts, but that is the challenge of the other part of the analysis secularly ignored by considerations and interests presumably more pragmatic or at least more immediate. The single intuition already says to us that this is the case, but all class of arguments comes to confirm it. Mathematicians are fully within their right to explore their subjects as they please and can; but it seems that what with the blessing of the nature of the things has united the zeta function, it will not separate the man with all his efforts. The atoms and the particles are infinitely more docile to our manipulation.

The zeta function and its implications appear to us like one of the most legitimate and fundamental subjects of the philosophy, that now, in addition, it is being loaded of all type of practical connotations and urgencies. Then its subject is the maximum possible extension of the global-local relations, the chance and the necessity -maximum extension and maximum existential implication. Be cause it has been spoken about the chance and the necessity too much and flippantly enough, and from the scientific mentality precisely, assigning them comfortable compartments for what we want to emphasize and what we want to ignore. So that even it is surprising that this great motif of the mathematics has not provoked a genuine philosophical interest before, to which without a doubt it has contributed the hermetic character of the subject.

Writing like generalist or mere philosopher, I must say that I have not lost anything in the inner worlds and infinite complexities of the function; what on the contrary it calls my attention and surprises to me is the same fact that this so general subject has gotten to consider within the mathematics of a so elegant, so net and so closed form, and with such an archetypical pureness, as well as the fact of its practically subterranean statute from the times of Euler to now, and being extremely significant its emergency in the present. And of course, it would be interesting to know why reason a so general subject is so indigestible for our actual methods and so dissonant with our interests; and why a so general subject is not able to find a more natural place in our understanding of how the things are. Even if our understanding could be far away from it, the zeta function is the sharpest thing that exist, and it is nearer to us than our own jugular vein. Said this, we leave the Arithmetic already and we return to the Samkhya, the universal theory of the fluctuations, and to the pulse like experimental example.

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Any prognosis that can make a doctor when is taking the pulse depends on the sharpness and precision of the diagnosis; naturally, this is equally valid for any type of medicine. Nevertheless, when we considered the purely analytical character of the time series of the pulse, this raises to us other questions on the nature of the prediction in general.

In physics, it is worth to say in its more linear aspects and behaviours, the precision in the prediction exempts to us of any determining causal understanding; having a model with its parameters, variables and constants in a manageable form, the question about the causes can be relegated to the limbo of the metaphysics. We have already seen in several occasions that the most powerful reasons exist for this, reasons that are in the same constituent plane of their activity. When in physics it is wanted to better understand something and more precisely –say, for example, the hypothetical quantum nature of the gravity -, all the effort is made to extend the dominion of the predictions, and nothing else. Then in physics, or at least for that to which it is conformed, the understanding is synonymous of an absolutely controllable prediction. And I

won't be who try to change to the reach and competence of the established physics.

This all changes radically when we approach complex, nonlinear and non controllable systems. Here, it is continued supposing that the more well-known laws with their more linear expression remain the same, but, apart of them, it becomes necessary in general to also suppose another type of conditions that assure the stability and other typical characteristics of the behaviours. In such conditions, we either resign ourselves to a study *ad hoc* of the multiple particular details of the system, or look for another class of more general signatures; and in fact, both things occur together usually. Nevertheless, it is continued looking for specific levels of causality forgetting that in the fundamental level the causes have never been specified.

Within the framework of the Samkhya or the Ayurveda this problematic is not even considered. Any process is reduced to the form of its temporal series; but this one not even is reduced to a space of coordinates. There is no need to say that for us a time series is something very different. This is valid also for the assembly of organs and anatomical characteristics which here we see indeed like agents of the "causality": all of them are products of their respective series and sequences, no matter how hard they are connected.

When we see a face, we are seeing the product and the last form of a time series. We think about it very rarely, although it is evident. For the Samkhya, the same fluctuations of *gunas* or *doshas* are equivalent to small phase transitions towards the interior and the exterior to the system, with a mediator that penetrates and goes beyond those apparent ends: in terms of the organism, this goes from the skin to the bones, with a sensitivity that surrounds to the assembly and shade off, but that continues being clear in the form –and not another way occurs in the pulse, with the form of its temporal profile. The same solid, liquid and gaseous phases maintain a correspondence with the *gunas* that goes beyond the analogy.

We say too often that the man always has wished to extend his predictions, but nothing falser than that. In the past he was much more worried than us about the interpretation of the reality, that not of its prediction. The prognosis of the *vaidya* cannot be remoter of the prediction of the physicist: the *vaidya* tries to understand the reasons of the uncontrollable, and the physicist of what he can isolate and control. The advantage of the first vision is evident in everything concerning the behaviour of complex systems. What we have not explored nearly at all are the relations between both methods; because if it is certain that they are interpenetrated, it is not less certain either that they are excluded.

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The stock market is the maximum exponent of a system of signals under the most intensive scrutiny. Known it is that the financial analysts and the agents continuously speak about "to take the pulse to the market". Metaphor or not, there is no better expression to describe something than no analyst knows in what consists it exactly, beyond taking the most direct contact possible with the flow and the fluctuation of the stocks or values. Naturally, the most direct contact with this flow is to participate in it, to unite oneself to the torrent of buying and selling, observing the reactions and the "tone" of the market.

The efficient market hypothesis says that in a certain moment –at any moment the prices of the stocks already reflect all the relevant information on the market; or in more attenuated versions, at least the main of the information. Since the relevant information in this respect can be unimaginably varied, it is difficult to find in the daily life a similar postulate of synthesis, update or reduction; even remember us, in the further sphere, the famous "wave function reduction" of the quantum mechanics. This postulate of actualization cannot be more related to the hope of the *vaidya* that which in the pulse all the distinctive elements of the health and the disease are yet present –with the sensible difference that no *vaidya* will pretend that his analysis, diagnosis or reduction can be confined to a moment or purely momentary state. A suitable temporal sample, an auscultation with a minimum interval of time will be needed.

The efficient market hyphotesis is considerably more hypothetical and radical and than the vindication of *vaidya*, and nevertheless we give much more credit to the former than to this last one. In our world it would not be surprise that we were more sensible and considered with the money that with our own body. The hypothesis itself can be compared with the idea of the "random walk", although on the other hand the

presumed assimilation of the information turns this randomness the most relative and ambiguous thing we could imagine. On the other hand, it is quite evident that this hypothesis is not but a reprint of the sufficiently ambiguous "invisible hand" of Adam Smith, which invites us to trust in the effectiveness of the free competition like a new incarnation of the providence.

Precisely, the theory of the efficient market is a form to do without all the spurious speculations of the so called technical analysis, that is not another thing that the interpretation of the graphs by themselves. In opposition to it we have the so called fundamental analysis on the real structure of the companies that sustain the stocks. This last one does not try to predict, but to understand what there is in game. The clinical analysis that the *vaidya* realize, his diagnosis, would agree precisely with this kind of fundamental analysis. But, on the other hand, which makes buyers and sellers at every moment, whether they consider a type of analysis or another one, it cannot stop being speculative in a high degree, and being the market which is –and affecting more and more the curves of the price to the internal dynamics of the companies; so we have another species of inescapable duality, that the theoreticians, until now, have only been able to contemplate in ambiguity terms. The inside-out type duality between the technical and the fundamental aspects is in fact irreducible in its own terms, and nor to say that it is of highly similar nature to which exists between *prakriti* and *vikriti*.

This is not the place for doing a detailed analysis of the paradoxes of the of the efficient market hypothesis, thing that on the other hand already has been made over and over again and with so little fruit. In the context of our writing, it is enough to say that the dynamics of the market is not punctual except in the graphs: the acquisition and the sale of stocks, like any transaction, are simultaneous by definition; but not so the orders of acquisition and sale, with its added tendencies. The paradox of the efficient market, raised just at the beginning of the twentieth century –the century of the paradoxes, and not only theoretical- is not but an exemplar among others many of identical or very similar structure, generated all by a purely binary posing in terms of yes or not, with excluded middle, in a system conceived alternatively from an internal or external perspective. This could be applied as much to the paradoxes of the set theory, relativity, quantum physics, and thermodynamics, and other many. And though apparently theoretical, all has contributed in not little measure to install to us in the ambiguity; until the point in which the contemporary world has become a systematic running of this ambiguity, so apparently fought with the exigencies of the scientific exactitude. And we think that there are in all this substrate of ambiguity and paradoxes not simply theoretical problems to solve, also a great inertia to mobilize.

It does exist for the market, not only an "invisible hand" like the one of Smith, but a left hand next to a right one as we have observed in the pulse? Not anatomically, certainly. But there is a duality of components that contribute to something very similar, and perhaps almost identical. Of course, the conditions of stability in a market do not have anything to do nor are comparable with those of an organism; but there is an assimilation and an elimination; a cycle of creation and destruction, and not only at a level, but to many levels. We do not have nor the smaller idea if it is possible to decompose naturally a rough curve as the one of the stock market in two as happens in the case of the pulse, or if it is simply impossible; but given the similarity of components implicated, it is possible to learn very much of the approach of both models, respecting all its differences. We always spoke of the most satisfactory characterization of the fluctuations.

The curve of a stock or company never is isolated, but contains the highest degree of sensitivity to the outer circumstances and the behaviour of all the other curves; and this as much throughout the time as almost simultaneously. Of course, there is all class of combinations of graphs. But in any case, if we had some frame of reference for the optimal state of the values as it can be deduced in the pulse, this would imply very little prediction; that is to say, the predictive component would be more implicit than explicit, and everything what it would tend to obtain would be a momentary adjustment around the optimal values –reducing the speculative component near to the minimums. It is this possible? Don't we continue moving inside the same paradox, that speaks us of how the own knowledge affects to the sensitivity of the system and its evolution?

This is a paradox only for the predictive-speculative method that characterizes to us. In the frame of the *gunas* and the Samkhya, the sensitivity and through it the knowledge form an integrant part of the curve and the temporal series. But this excludes as well great part from which we considered prediction, and even dilutes the invariant character of the temporary axis by means of the duality and its fan of possible combinations. There is no possible magic in this respect; the only thing that would change is the centre of the

attention. But this is much and more than what it is believed.

Of being viable, this method of analysis of the fluctuations would be applicable to the economic behaviour in general and would impose new criteria: because by force it would radiograph and clarify so many elements that today are opaque and that even there is not too much interest to bring to the light. The question is how much the dark we can allow ourselves.

On the other hand, it is not improbable that this new approach throws light on all that nourished body of modern formal paradoxes.

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The example of the stock market is particularly useful because in it the more purely quantitative aspects, and the contents and the semiology cannot be more united both; but not in other way happen with the organic functions. We already can put the heart in the billfold, that the billfold will go to the heart.

It could be thought that the scheme of the *gunas* of the Samkhya is similar to the one of the dialectics, the well known scheme thesis-antithesis-synthesis; but dialectics is idealistic, even in its popular and naturalistic versions very previous to the idealism, precisely by its appearance of production of the reality.

Also the modern analysis, even being applied faithfully to experimental data, is idealistic since the moment that believes to produce the movements from closed functions with changes in the values or coefficients. Nothing of this has to do with the Samkhya. Although we even found characteristic mathematical structures for the fluctuations with respect to the balance, we would only have a selector of readings, a tuner that allows us to listen better what there is present. A complete and closed description as the one of many analytical functions would be often irrelevant, would make that listening impossible.

In fact, if there is something fundamental that corresponds with the fundamental nature of the *gunas*, the sensitivity, the action and reaction, is the same articulation of the language, with its three grammar people and their equivalent subject-verb-predicate flow. Not in vain it is adjudge to the name of Patanjali a treatise on sanskrit grammar, in addition to another one on medicine. The pulse of the cat truly would say "I-eat-sardines" if it had not much more varied and subtle things to count. By the way that that language of the pulse has so much an articulated and discreet aspect, in addition to continuous the most apparent one. This sends to us to the old India distinction between *vaikharï* and *madhyamä*, the articulated discursive language and the inarticulate and deep language of nature and things.

Only in a frame as this one could have some value and specific weight the non decidable questions of the last century on semantics and syntax of the badly called analytical philosophy. To speak about the language and the languages of the nature could not be a metaphor –rather the human language has to be a poor metaphor of that other language, the Adamic language of creation.

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When the verb, the breath and the time disappear of our perception of the nature, the middle, also the entity of the two other instances is diluted. Something more than a dimension of the "problem" vanishes therefore, and something more than its "depth"; it disappears also the man and his privilege of being the middle and the means, or even just a means in the middle. Those who put at the top the humanism and science jointly would have to meditate on so a doubtful pedestal.

In addition, the exuberant growth of patterns that we believe to see in the nature, its abstract intellectual recognition, has resulted in the proportional impoverishment of our sensitivity to perceive them,

until the point that to speak about any direct perception must sound to us like a fable unavoidably, or to a clumsy translation of some underlying mechanism or highly refined pattern. Refinement and dulling can go perfectly hand with hand, and meanwhile, we are condemned to look for in seas of the abstraction what we think that there we have lost.

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Some investigators, like the biologist Zvetkov , find significant or at least intriguing that the ratio between the diastolic interval and the systolic one of the cardiogram tends to come very near to the value of the Golden Section, that, like was made long ago, we prefer to call Continuous Proportion. This same ratio tends to occur also with good approach between the average diastolic and systolic pressure of the aorta. The certain thing is that we find the Continuous Proportion in all class of places and aspects of the nature, without on the other hand these manifestations have another character that the purely phenomenological, when it is not simply arbitrary associations; and often, barely there is a criterion to separate both things.

We do not have to the date the smaller idea of which can be the importance of the Continuous Proportion in the nature, nor could either define the plane that corresponds to it. Nevertheless certain properties exist that are worthy of mention. In the first place, that has not been the smaller explicit relation of this constant with any sphere of the dynamics, and that therefore cannot be derived from it. This is precisely what relegates it to a value completely secondary or very small; and nevertheless, it is this same thing what turns it something as gratuitous as mysterious. Be cause, after all, this constant appears with perfect clearness in the phyllotaxis of the vegetal groupings, evident expression of development and movement. What today we called Fibonacci numbers, and that this one took without a doubt from Arab mathematicians, it was described for the first time by Gopala and Hemachandra, around 1150, with regard to problems of exact and optimal packing for objects of lengths 1 and 2; the last one of these even applies it to the metric of the sanskrit poetry. In this sense, it would not seem stranger that the sunflowers and so many other plants find the solution for something that there is not a problem for them. Nevertheless, this does not leave the smaller track in the dynamic description of the process, and for a good reason: the cells reproduce and accumulate of discrete form. Precisely this accumulation of discrete order tending to a ratio in terms of real numbers or continuous fractions, is one of the most remarkable characteristics of this constant. Oleg Bodnar, for example, has given a model of vegetal phyllotaxis in four dimensions with a hyperbolic turn in the related functions. This same property of union between the continuous and discrete dominion has called the attention of mathematicians and information theoreticians like Alexey Stakhov, that have demonstrated the wealth of algorithmic and combinatorial possibilities of the constant with refined methods. In some of its numerical extensions, *phi* permits a conversion or optimal translation between analogical and digital expressions, for the same ratio already pointed. Their same algebraic and quadratic properties, elementarily simple, allow infinity of connections as well. Eduard Soroko has shown its relevance in problems of structural and functional stability with many components, settling down valuable bridges with the information theory and its measurement; his own information theory has a purely monadic starting point. The same Stakhov has developed an algorithmic and asymmetric theory of the measurement…We could give some examples more of important contributions on the subject, which nevertheless, remains almost as disconnected and marginal almost as always. This no doubt obeys to its absence of relation with dynamics.

What also makes to think that perhaps would be some more luck within the number theory, to which the subject seems quite open. The same Stakhov and others have developed the hyperbolic functions of Fibonacci and Lucas, who extend the Fibonacci numbers to the continuous dominion, in a way somewhat similar, although in a much more reduced dominion, to that of the analytical number theory. This would have to be very important, precisely to isolate the less dynamical aspects of the more general arithmetical functions, like the Riemann zeta: and we have already seen to what extent these less dynamic aspects are important from our perspective. The same vegetal phyllotaxis exhibits the primary ratio between *phi* and *pi*, first of the great constants of the calculus, in the so called angle golden, equivalent to $\pi/\tau 2$. Perhaps, on the other hand, it is

possible to explore to what extent *phi* is antagonistic of the other great constant of the analysis, the number *e*, base of the natural logarithms and exponent of the proportionality on the functions. The ratio of this antagonism or mix-up can be reduced to the fact that *phi* originates the most elementary and particular association of additive and multiplicative properties, whereas *e* gives rise to the most general, also the more proper of dynamics and probability. Said another way, *phi* permits discrete and generative relations, whereas *e* tends by its nature to pulverize them. But this would also take to subjects of number fields that are out of my reach. In addition to the mentioned, *phi* could have importance like constant by other fundamental characteristics: it is the simpler mathematical form of recurrence and self-reference, it express the relation between a part and the whole and in addition does it showing the more slippery ternary relation, defined by the equality of ratios AB/BC = BC/AC. And finally, but not less important, it supposes the more elemental connection between symmetry and more elementary asymmetry.

On the other hand, the Fibonacci numbers appear in Klein groups and fractals. The same Klein considered the regular icosahedron like the most involving and interconnected motif of the whole mathematics. This is related as well to the equally mysterious and more recent emergency of the ADE classifications, that appear in the most divergent and unsuspected fields, with very few well known on its possible relations: Lie groups, critical points of non-modular functions, algebraic singularities, crystallographic reflection groups, and many others. The same platonic solids or regular polyhedrons are the archetype and mother of these classifications, always referred to simple finite objects. These classifications are, apart from that, in the more alien aspects in respect with dynamics, or at least in the more limitative and border aspects of it. It would be necessary to see if all this is a chance. It is even possible to ask if this could not have some relation with the groups of six and five elements that appear in the division of the meridians of the Chinese medicine or in the canonical sections of the *gunas*; all this is highly speculative, but we have the possibility of experimental contrast at least.

From a statistical point of view, it is observed an increasing appearance of phenomena that seem to respond to potential laws or scale laws, of which the Pareto distribution – non-Gaussian distribution- is preceding and archetype. This type of distribution or 1/f noise, more or less independent of the scale and also of an explicit dynamics, maintains necessarily a controversial statute. It seems as if the concurrence of space and time, released of the partial adjustments of dynamics, acquired a magical characteristic, that is to say, the liberation of the causality. But this "causality" is only the one of dynamics, because the existence of interaction within these systems is often clear and evident. Only one careful separation of these superposed elements could throw light and law on which today remains like mere phenomenon.

Let us close these considerations with a reflection on the principle of least action that perhaps fits here. In physics the principle of least action is particularly bounded with the time; for example, the minimum paths of Fermat are the trajectories for which the light spends less time in its trajectory. In a similar way the relativistic physics has defined geodesic or minimum lines for the continuous space-time. This is enough strange if one thinks that the nature, and specially the inorganic nature, must have the most complete indifference with respect to the time and its saving, that surely does not provide an interests rate to it. What it seems to demonstrate once again and from a different perspective that the time of the physics is an *almost* entirely spatial device. The organic growth shows to us the opposite face of the coin, where the time is indeed decisive and constituent by nature. Precisely the presence of the Continuous Proportion in infinity of biological ratios, like in the sunflowers, it is tried to interpret not in terms of the principle of least action, but rather of a principle of material economy. That is to say, what it has cumulative and irreducible temporal components we want to explain it by principles of material and space economy, and what it is almost purely space we try to order it by principles of temporal economy. It is not this the best evidence of that here an inversion and a strange crossing has taken place here, and that something essential it is lost in the operation? Nothing would take to us more far than the resolution of this problem.

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To what extent the temporary series can give a record of the space constrictions of a system? At first

sight there are enormous differences between systems and systems. In the case of the pulse continue existing necessary connections; in the stock market also, but it is necessary to look for the pertinent dimensions of very different way.

If we said before that the analytical space of dynamics continued being geometry and algebra except a part of Arithmetic, also it would be possible to hope that the temporal series suitably studied –and the notions of the Samkhya are our main reference here- had components or irreducible dimensions within the pertinent simplectic structure; and perhaps it is possible to reach that taking steps in the suitable direction.

The pulse is an example of which we already have to our disposition the class of model that combines these dynamic and arithmetic aspects suitably, but until we do not study it properly, we do not know what can be there. Not even we know if of the correlation of the pulses could be deduced with fidelity something so basic in the organic balance and easy to measure like the alkalinity or acidity of the blood; but if that is possible, surely that other many data of the clinical analysis could be deduced with the suitable extension of the frame of reference.

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To what extent the confusion with respect to science arrives, and with contemporary science in particular, is illustrated with the topic so frequently repeated that it comes to say that the Newtonian science was “hierarchic and theological”, whereas the present one “destroys hierarchies and finds order in the chaos”. The opposite is almost the certain thing, although, not to simplify in excess, it is possible to be detached: “Newtonian science” is the less hierarchic science that exists, and in that exactly its absolutism is based. We have already seen why the three principles of the mechanics exist. The modern science to which the topic talks about, the heteroclite disciplines of the emergency, the evolution and the complexity, which does precisely is to create hierarchies, levels and meta-levels where more likely there are not, and everything because they are incapable to accede to an apparently simple constituent level like the Newtonian one; as far as that of the order in the chaos, as today the things are raised, we better don’t talk about it.

But the certain thing is that as much one posing as the other runs like chickens without head. It is necessary to leave the soft fantasy of which both methods are complemented, as if they were the classicism and the romanticism. No, because a single meeting point does not exist, but lines that are superposed to different levels. Let us see, For what we want so much “teeth and claw" if the third law of Newton not even allows the friction? A mechanist explanation of life, it is said.

Without a doubt the evolutionism and all the phases of romantic science, cosmology including, have benefited enormously from the credulity generated by the ample enough emptiness of the analysis, simultaneously that the faith of this one increased in view of the food that the contents or the temporal matter promised to incorporate, without having the smaller foundation for it. It is already time to contrast these hopes, to see what they weigh in the balance. A delicate operation.

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Time against the field.

The modern scientific view of the world, like the man of Shankara that confuses the cord with a serpent, lives the illusion on this superposition of planes: everything what cannot be explained by the dynamic analysis, because it does not have internal space for it, we gave it to the dominion of the time and the evolution, that as well, it has to be governed by identical dynamic principles. Soon, and to complement the evident emptiness, one resorts to the probabilistic elements, that always are diffuse and uncontrollable, to extract of them the most convenient elements within the previous context. The probabilistic field, as diffuse as can be wished, may be the survival of the species or the economic competition: at no moment the conflicts are

considered of direct and local way, but that these are stumped and scattered in the maximum possible generality. Also in physics we have examples of the same: Oersted made his fundamental discovery that proved the relations between electrical and magnetic phenomena, coining the term electromagnetism. Peculiarly, used the term “conflict” to speak of these relations; all this was absorbed soon in the concept of "field". We are specialists in dissolving the difficulties in the limitless and general space, which will send us as well to other spaces.

If the interpretation of the temporal series advanced in its own sense and direction, and not like a poor assistant, we would begin to see all these things more clearly. Perhaps it is to this to which secretly we aspired speaking more and more every day of the “real time” processes. There is something here that sounds like an inescapable demand, no matter how hard often it is replaced by the virtual representation, exactly the opposite, again.

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Faraday, for example, who was the one that developed the idea and the concept of field, did not need mathematics to develop experimentally a completely new vision of the electromagnetism, and in a time in which some of the greatest mathematicians of all the times, like the same Gauss, barely were able to penetrate in the paradoxical forest of the electromagnetic phenomena. What Faraday warned was the importance of the dynamic process to advance in the investigation of these phenomena: shifts of position of the magnet or changes of intensity of another current. This was the decisive thing, and from that Maxwell could produce a totally consistent theory. Without a doubt to Faraday helped his ingenuous mentality as much as his incessant experimentation.

Maybe something similar must happen in the area of the theory of the complexity and nonlinear dynamics. Of course, the field is still much more vast and multiform here, although it assumes that we look for as general principles as it is possible. My experimental invitation is of this sort; when we have the suitable experimental protocols and we learn to work with them, inevitably the Maxwell of the moment will arrive to give us some of the equations. We did not need mathematics to see what is missing here, but we need them indeed to explore it and to weigh it properly. Clear that this is a mere parallelism to encourage this class of research, because the implications in this area, it is not necessary to say it, are completely different.

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One is inclined to think that in science exist defined cycles of production, a little in the style of the Kondratiev economic cycles for the predominant types of industry. In this case, the cycles would come to be about sixty years, approximately. Without a doubt between 1887 and 1947 a very well defined circle is closed, which goes from the experiment of Michelson-Morley, the first observation of the photoelectric effect and the verification of the transmission of the electromagnetic waves at the speed of the light by Hertz, to the present version of the quantum electrodynamics of Tomonaga, Feynmnan and Schwinger. This last one supposes the beginning of the quantum theories of fields in which still are embarked the theoretical physicists. This present cycle would come to close itself in these years, more or less agreeing with the starting of the large hadron collider of Geneva, waited for the 2007. And peculiarly, if the cycle of 1887 began with the experimental contradiction of the theory of the ether or medium as reference frame and with the reinforcement of the speed of the light like constant, also now, before a cycle that seems to close itself, the statute of this constant is questioned, as well as the phantom of the cosmological constant, and an experimental resolution of the vacuum like frame of reference for the masses. So we can see important similarities, pointing almost all of them at problems of definition of the medium and frame of reference, although we will not speculate on the results.

But the fundamental physics is not everything at all, and even it seems that its importance is

diminishing decidedly before the much more immediate challenges of the complexity. And truly, the modern vision of the complexity also begins in the starting of this second cycle, there by the 47 or the 48, with the appearance of the computer, the transistor, and works of Shannon and Wiener. The computer and the new notion of information are the instrumental vectors of our modern idea of the complexity. Even the modern genetics, that was born shortly after, has been totally conformed, and to undesirable and absurd limits, by the metaphors of the world of the information and the programming. Let us hope that this cycle also is next to close itself, of which we could show more indications than those that at first sight appear.

The metaphors of the information have arrived until a point so that even abound the physicists and mathematicians now who conceive the universe like a gigantic computer; that is to say, that so much time has been boasting science to surpass the anthropomorphisms to fall in coarsest and vulgar that it is possible to imagine, derived from a mere artefact. At least, the ancients knew well the rank of their myths and metaphors, and after all it was not about the man the only the spoke, nor even the essential often; but these wise people of the last hour get to believe in their metaphors of the most literal way, and they even despise somewhat to those that have still not found out of what the subject goes. They are, therefore, the best incarnation of the limitation of their own program. But were they or not an exponent of one more general barbarism, this does not have to worry to us, because the man creates new devices more quickly of which costs to us to internalize them. I venture, therefore, that enough before they begin to fulfil the dreams and nightmares of many on the digital world, will change the operative concept and the reference of the same information, beginning with the computation and its use of the time. Be cause there is too much to explore; and because the world is for the computer a greater challenge than the computer for the world.

The sequence of the human genome was the last great reductionist project that was given to the modern science; simply, there are no longer anymore simple objects of importance that we could treat in the same way. Not even in physics, where fields and particles begin to show a dependency of the vacuum that is impossible to reduce to simple cases: even the scalar fields of the so called Higgs mechanism require a multi-compound structure. The reductionism is collapsing visibly, in the same way that the old criteria of prediction; but it worked so well, and for the prediction indeed, that it is very difficult to resign ourselves to its decomposition. The reductionism nowadays is not more than pure inertia, but this fact does not mean that here science finishes and we must be reduced to the technical problems and to the particular details; on the contrary, we think that what can begin now is much more interesting and deep that all the previous developments. And in addition, this does not consist in one more turn of the screw in the dominion of the abstraction, but rather on the contrary, also. What it is not necessarily in conflict with the fact that the mathematics are more useful when more abstract they are.

Therefore, we do not think that the world of the future will be done nor of atoms, nor of bits, but of monads. Leibniz was the great precursor as much of the notion of the complexity as of the modern computation; nevertheless, the monad, his central and indestructible concept, became darken and was made doubtful indeed with the superposition of the badly called modern “dynamics”, that he himself tried to avoid, but not to negotiate. I have tried to show in what sense has to be understood that the monad is closed - in the same one, indeed, in which it is in relation with the environment since the beginning, and exactly by the natural extension of the principles of the dynamics that Newton constrained. And thus, the monad finds its breath and becomes the most natural and robust of all the concepts. The same concept of individual will change as a function of the understanding of the monad concept; because there is not to say that the nominalistic concept of individual, unlike the I-sense, is completely derivative, and not original at all. An oafish concept indeed, that even can not include the idea of reciprocity within.

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And speaking about our devices, none like the clock itself, of which we have been deriving all of them

until to arrive to the same computer. And with them, also our irrepressible views of the world.

If what is wanted is to vindicate the “real time”, what can we understand as such? It is possible to hope that that real time includes something more than the live images and today news? And what is actuality? The images are not, and less from day to day. What in fact we look for already is at the other side of the mirror.

Real time, present or actual time, is for example the gradient on which is based the climate and the climatic change. Of which barely we know anything, by the way. The paleo-climatology have verify recently changes and abrupt climatic inversions, in less than ten years, in the gulf of Mexico, Greenland, and other many places; before it was thought that an important change required a term of centuries. With the problems of gradient and stability, that include all sort of complex behaviours, from earthquakes to our own devices, we return to the subject of the pulse and their “dynamic” coordinates, the form more reasonable than is happened to me to approach this question, that is to say, the temporal reference for a gradient, something that is to look for within the same system. A paradigm in the own sense of the word, if we consider that never has been exposed openly and that since the same Patanjali rather always has been given as supposed.

This real time can concern the analysis as to our sensitivity as much; what of course it is not viable is a direct representation; and even of the indirect representations only is possible to say that either they are a mean or they are an obstacle; that is to say, exactly just like it already happens with the present daily representations. Nevertheless, in as much in which we are able to escape from the predictive and speculative horizon usual now, we escape also of unnecessary representations.

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It has been said thousand times that Galileo moved away to us of the centre of the universe, that the theory of the evolution cleared to us of the cusp of the creation, and that the psychoanalysis denied to us the dominion on our own mind. But, being already lame the first of these three concentric revolutions, the other two, that tried to model themselves to image and similarity of the mechanics, have been more events of the public opinion and the imaginary that true advances of the knowledge. Neither the mind, nor the life, nor the mechanics have been explained nor understood. The mechanics continues closing to us the passage any superior understanding, and thus it is understood the innumerable amount of nonsense and incredible artifices that are postulated like candidates to explain the consciousness, in which is pretended like fourth and definitive "revolution". Nothing of this has the smaller plausibility, and the only good thing of so many desperate attempts is to convince to us that something extremely basic has been avoided from the very beginning.

Many are those that look for the magical concept today that could give potentiality to this last turn: ideas around the computation, the information, the determinist chaos, the quantum theory and things of the sort. Ideas of last hour that put in question the minimum of which is considered consolidated. This is quite normal if one thinks that the consciousness is the last and the most conditional thing. Our perception, on the contrary, is that there is very little or nothing to say on it, and that those other layers are what would benefit from a new principle; since nothing really has been explained by them. Even the predictions of the physics, so precise, on objects that very probably are not understood, are based on last instance in the correspondence of the proportion, and not of the causality -from here the "inexplicable effectiveness of the mathematics". This can happen perfectly without we make another thing that to cut layers or flat films without any other thickness than the possible and imagined relations with other objects, which are also defined in so to say bi-dimensional layers.

The triple concept of fluctuation with respect to the balance can break through from the most fundamental layer of the physics to the immediate subjective experiences: from the measurable movement to the qualities, and from a set to its details. In the landscape of present knowledge hardly we will find another bridge like this one, and this will not change while the modern science, that historical contingency, exist. Other approaches not even can scratch the real thing – it’s like make photographs.

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The empty space of the analysis is synonymous of freedom for the arbitrary interchange, reducing to the minimum the internal bounds of its objects. And thus, everything becomes possible object of the analysis. One of those possible objects seemed to be the series of the numbers, but the bounds turned out here to be stronger than all means of decomposition available; these, on the contrary, did not make another thing that to manifest them. Maybe, during a long time, and still today, we have confused the roots with the branches.

The harmonic or Fourier analysis was the trigger of the modern concept of function. Exactly when this concept became general, revealing until where its arbitrariness with respect to the empirical curves arrived, we began to confuse the idea of function with the one of an automatic execution –with the automatism itself, when this seemed less justified than ever. Today it seems more than probable that it is an opposite tendency the one that generates a new function concept, which on the other hand is acquiring levels of necessity. Something says the same slowness of these processes of the depth of the changes. We will not find an equivalent of the harmonic analysis for complex systems, but rather the analysis will end up adapting to the nature of which resists to us.

There is in Riemann an invisible gesture, that one whose willingly gives back a key to its legitimate owner. More than an offering, it is a piety gesture in the sense of the ancients, confirmed by the modesty of his author and inconceivable within the voracious modern scientific spirit. That gesture cannot be in greater contrast and in greater agreement with the time at which it happened, when the nineteenth century positivism reached the cusp of the vociferation and the vulgarity. In the same month of November of 1859 that Riemann gave its paper on the prime numbers, appeared on sale the first of the innumerable editions of "The origin of the species". Also the statistical mechanics and the modern spectroscopy raised.

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The logic of the Samkhya leads to us with an irresistible force in as much we know to resist to the application of the force. So it seems to be the eternal criterion, imposed and to our disposition.

102

The subject of the Samkhya or the Yoga is to extend the internal space trying not to establish the smaller differential with the external space that necessarily is to be respected. Thus the difference between the interior and the exterior, and the field of reference for the movement stops by the movement itself. Yoga is to penetrate in the unlimited using the limits that are given to us, not trying to transgress them or annulling them, but with reciprocity. The Samkhya is the contemplation of the balance and the Yoga its practice, not existing true difference between both, and being the contemplation the gradual movement of the purity in the participation. In all the theoretical contemplation that we have made we have tried to guide us by this same practice.

103

The subject of the time and its sequence is simply the subject of our insertion in the reality.

104

The same modalities, or the *gunas*, are also only objects of knowledge for purely conditional purpose and therefore impermanent: that is already its form of evolution from the beginning and even without beginning. Therefore, one can completely turn the back to them realizing them at any moment; no sort of knowledge forces to us to contemplate them, and further from it the one that the Samkhya proposes as its crown. This would have to make us think about the indescribable been of freedom in which the consciousness dwells, being the nature of the *gunas* the existence with the appearance of the individual, and being the consciousness the pure universal existence. And if metaphysics is just the postulation of the extra-mental like an object, since the extra-mental is postulated here decidedly, but not at all its condition of object, this has to do with metaphysics as few as with psychology.

105

Consciousness has no memory.

106

At no moment we reject the aptitude of dynamics to deal with an ample rank of behaviours, and in fact our assumptions and inferences with respect to the pulse are dynamic in a great measure. The variational principles are always of global nature and ignore the causality; when we applied them to an open system that admits an explicit reference of the interchange between the environment and the interior of the system by virtue of its peculiar duality, the time and the causality have to also admit a new and more or less explicit expression, but not merely supposed as it happens with dynamics in general. The same idea of the balance has to become also more or less explicit, because to no other thing refers this concept of causality.

And the same must happen in the cognitive plane with the existing duality between the prediction and the memory, operations of opposed nature that cannot be simultaneous and that by the same require the adjoined assistance of its complementary in the phase of predominance of anyone of them. It would be to hope that this found its necessary dynamic correlates in real and complex variable. Surely this is much less abstract than what now we can imagine, and experimental results incomprehensible today but verified thousands of times, like those of Kornhuber relative to the temporal delay of the voluntary reaction, with more of a second or second and a half of interval, will find their interpretation in this context.

107

The Samkhya already incorporates the external medium in the processes, leaving freed to the same the problem of the reference. To define from the outside questions of evolution and balance, or the relevant ranks of precision, it seems the improper thing. Now it is to see until where takes to us to try an internal definition of the movement and the modifications adhering to which precisely circulates within the temporality, the only

own measurement of this one. Perhaps thus we can locate to us and our intellect in the middle of the conditions, or as near it as we can. Anyway, the distinctions between the mechanic or not mechanic, the determinism and the indeterminism, become arbitrary and irrelevant, because they admit indefinite degrees that never are incumbent on that question, that already is raised from outside. The intellect is one more of those degrees, simultaneously than its refinements, which precisely leaves back the complexity of the states, if it is certain that the essence of the distillation is the essence.

As far as the consciousness, it is still certain that it is not the object of any discipline. If some grant possibility to that delirium, it is because they suppose it like the more highly conditional, while they assume the unconditionality of the physical laws. But the situation is exactly the opposite: any physical data, including the measurement of the rest, already involves a modification, an asymmetry of the space and the time.

The Vedanta could not express it better: If the consciousness can not explain itself, what thing could explain it?

108

The real is the existence. The existence is the consciousness. Consciousness is the real thing. That is the triple affirmation in which it is summarized the Vedanta and the Samkhya, a triple identity as existential as absolute. Empty? Maybe: consciousness is completely indifferent to the fullness or the vacuity. Consciousness, already we said it, has no memory, not at all a paradoxical affirmation that anyone can verify by means of the portion that corresponds to him. An affirmation in which underlies very considerable possibilities.

If the consciousness does not have memory, in that exact measure the consciousness is will; if the consciousness is will, in that exact measure the consciousness does not need to know. That exact measurement that we are speaking about is the conation, which we don't need to confuse necessarily with the will; then if there is conation, the consciousness is only intellection, and if there is none, the consciousness remains undivided in these terms and indifferent to them. This is an example of something which not even needs to be thought; then the terms fall here by themselves, without thinking about how we could take part in them. And exactly in the same way but in very different measure it happens to us with the equations. We are not invited to think about it, but to verify it. Consciousness has no memory. With so much disorientation, we can not think in a better indicator of the "location" of the consciousness, for those who want to look for it

For those who please to quantify, an unobjectionable definition of the consciousness is that it folds the three modalities in nothing, corresponding this way to the triple previous affirmation. This triple identity does not have sequence, and therefore it is unattainable for the logic or the mathematics, that sometimes believe to be in the ultimate degree of the simplicity, the unconditionality or even the elegance. In fact, the mathematical forms are only appeal to other forms, and would be enough to have the sufficient attention, with no need of a mathematical intellect, to realize that they are not more near from the eternity than the first or the last of the words pronounced by the man. The opposite is a presumption, motivated nevertheless by the implicit movement in the aspiration, more than by the execution or the assumption of conscience; therefore, and like all movement of the language, it has an excusable necessity.

So that the triple identity of the Vedanta offers us like a space for the contemplation to our whole disposition, since in no case it imposes nothing to us. It is the maximum and the minimum that can be said. But it is also a proclamation and the testimony of the most legitimate of the conquests, because it has been made inside the pure conditionality, of which all the forms depend.

In any case, to mention the consciousness is not absolutely inopportune precisely because of how acute begins to be our conscience of the insufficiency of all the formal systems, and by our very justified distrust on the fascination of all the theoretical abysses. We can assume this in opposite direction of the rhetoric and the brutality, which already are made present in the same intellect.

Being the intellect adhesion before any other thing, if it does not realize that only lets take, he is already lost, and only through the experience it will be able to recover of that loss, whenever it is made, and non only with the intellect, the sufficient effort. This is a fundamental subject for the Samkhya, because the

modalities exist indifferently like liberation and experience source, without excluding both terms except by the own modes. The Samkhya affirms that the liberation is the identity of the intellect and the consciousness: but this identity does not belong to the intellect, because all this, at least for it, is conditioned by defined degrees or modes.

Properly speaking, consciousness does not belong to me, I can only hope to correspond with it. And far from all rhetoric, here takes root any possible freedom. That is to say, there is no another one. The rest is only compulsion, and the lucidity of the intellect, always lent, out of the consciousness already is superimposition and blindness whatever will be the level in which it appears. Therefore the consciousness is neither a rhetorical subject nor a problem of location, but the only reference and the only means of evolution in the real time. Real time is consciousness with no memory.

SOME RECOMMENDABLE READINGS

"Yoga philosophy of Patanjali with bhasvati"
Swami Hariharananda Aranya
University of Calcutta, 2000

Institute of time nature explorations
(Related to the legacy of N. A. Kozyrev)
http://www.chronos.msu.ru/

V. E. Zhvirblis: "Stars and koltsars"
http://www.chronos.msu.ru/EREPORTS/zhvirblis_stars/zhvirblis_stars.htm

N.A. Kozyrev: "Experimental study of time"
http://members.tripod.com/~jtooker/kozyrev.txt

Matthew R. Watkins home page
Number theory and physics archive (the best resources about the Riemann zeta I know in the web)
http://www.maths.ex.ac.uk/~mwatkins/

TGD- Topological Geometrodynamics-Matti Pitkanen home page
http://www.physics.helsinki.fi/~matpitka/tgd.html

Paul Marmet
Absurdities in modern physics: a solution.
Subjectivity of Heisenberg´s uncertainty relationship
http://www.newtonphysics.on.ca/HEISENBERG/Chapter3.html

Koichiro Matsuno: Resurrection of Cartesian Physics
http://bio.nagaokaut.ac.jp/~matsuno/preprints/RESURREC.htm

Museum of Harmony and Golden Section (Alexey Stakhov site)
www.goldenmuseum.com

"Riemanniana selecta"
Edición y estudio introductorio de José Ferreirós
Consejo Superior de Investigaciones científicas, D. L. 2000.

"El cuerpo y lo otro. Introducción a una teoría general de la cultura."
Alexis Jardines
Editorial de ciencias sociales, 2004.

"El enigma del movimiento"
Alexis Jardines
Biblioteca Nueva, 2000

"La hija del capitán Starbuck (Hurqualya)"
Miguel Iradier
Biblioteca Nueva, 2001

"Cuadernos"
Simone Weil
Editorial Trotta, 2001

"Does God play dice? The new mathematics of Chaos"
Ian Stewart
Penguin Books Ltd. 1997

"Prime Obsession. Bernhard Riemann and the Greatest Unsolved Problem in Mathematics". An excellent introduction to the Riemann zeta for non mathematicians.
John Derbyshire
Plume, Penguin Group, 2004

"Cybernetics or Control and Communication in the Animal and the Machine"
Norbert Wiener
M.I.T., 1948, 1961