

The Metaphysics of Physics from the Perspective of Sri Aurobindo's Cosmology

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Abstract

We review the spiritual cosmology of the 20th-century Indian mystic and yogi Sri Aurobindo. Our aim is twofold. First to furnish a basic philosophical understanding of Aurobindo's vision, and secondly, that of making a comparative analysis with present scientific knowledge that could furnish an alternative metaphysical interpretation of the physical world. The rationale of our study is to question whether the observation of the physical world from the standpoint of the mystic experience could suggest some new theoretical framework for the metaphysical ontology of the world itself. Taking perspectives from the states of consciousness described by mystics may furnish us with a deeper understanding of the material and metaphysical character of physical categories such as matter, energy, force, space, time, and space-time. This is an introductory overview of Aurobindo's relevance for physical sciences and the conceptual foundations of physics, with particular attention paid to quantum physics.

Keywords: physics, metaphysics, quantum physics, Sri Aurobindo, Vedanta, philosophy of mind

1. Introduction

Modern theoretical physics is going through a profound intellectual crisis. While the first half of the last century saw several paradigmatic revolutions, most notably with the theory of relativity and quantum mechanics (QM), which culminated in one of the most successful scientific theories of all time, namely, the standard model of particle physics (SM), the search for a unified theory instead turned out to be an exceptionally complicated intellectual endeavor. The SM was indeed able to unite, in a unique conceptual frame, QM and special relativity and, as a natural consequence, could successfully unify three of the four known fundamental forces of Nature: electromagnetism with the two nuclear forces, that is, the strong and weak nuclear interactions. Out of the equation (literally) remains the force of gravity. Any attempt to go further and develop a unified quantum theory (QT) of all forces that also includes in its description gravity, the so-called theory of 'quantum gravity' (somewhat improperly renamed for a popular audience 'theory of everything') continues to remain unsuccessful. It is now more than seven decades since Einstein sought to find such a unifying theory; worldwide, several generations of physicists have attempted to crack this 'cosmic code'.

Moreover, the unintuitive aspects of quantum physics (QP), in which particles can be in a quantum superposition, or can be entangled throughout large distances, with quantum effects seemingly completely random, and with many other weird phenomena, lead to a plethora of interpretations of quantum mechanics. The latter, however, did not lead to a better understanding of the physical world and remained largely unverified speculations.

Slowly but steadily, it is becoming clear that the last 40 years of attempts to establish a new conceptual foundation that could lead us beyond the SM did not meet the expectations. Huge financial and human resources were invested in the exploration of theories that likely have nothing to do with what nature is really trying to tell us. We are not making any tangible progress towards a theory of quantum gravity, the proverbial 'holy grail' of modern theoretical physics.

There is a significant consensus now that, likely, one of the roots of the problem is found in an inadequate way of seeing and conceiving the material world. Questioned are our notions of what space-time, matter, and forces are, and if these might not be fundamental physical entities but, rather, emergent properties. Everything indicates that the basic pillars of physics must be modified and a change of

paradigm must intervene. New ideas and insights, original as groundbreaking intuitions, are necessary to get out of the impasse. The only way out seems to be a profound revision of the fundamental physical principles and the categories they involve.

Of course, we are not able to propose a final solution to all the above conundrums here, but would like to suggest considering another perspective. A possible standpoint on the issue of the interpretation of QP is that we will understand its strange properties and paradoxes only if we open ourselves in embracing a more comprehensive vision that goes beyond the materialist physicalist dogma. In particular, it might be interesting to get a glimpse of how the physical world appears to someone who has ascended to higher states of consciousness. We might question if our philosophical and conceptual difficulty in understanding the foundations of QP might have something to do with the fact that we look at the world only from a purely rational and analytic perspective, based on human sensory means and with reason being the sole judge and ruler for truth and reality, as physics and most sciences do. It would therefore be presumptuous (and against the very principles of evolution) to believe that a human cognition based on its analytic rational science and sense-mind perception alone would be the last rung of the cognitive evolutionary ladder, with mind being the ultimate tool of knowledge. Because, as Aurobindo puts it, Consciousness is a “*self-aware force of existence of which mentality is a middle term.*” (Aurobindo, 1914-19, pp. 95, bk. 1, ch. X)

Taking this into account, it could be inspiring to absorb some of the spiritual and mystic descriptions of reality that he cast into philosophical terms in his writings, and what we will call an ‘integral cosmology’.

Most of Aurobindo’s teachings have attracted attention among Western psychologists. This led to the development of an ‘Integral Yoga psychology’ (Debashish, 2020) But scarce attention, if any, did he receive in the domains of the philosophy of science and philosophy of mind. This motivated the author to work out the present essay.

Sri Aurobindo was an Indian mystic, yogi, poet, and philosopher of the first half of the last century. It is impossible to synthesize his teachings here, not even superficially; one can only recommend that the interested reader resort to his writings, e.g., (Aurobindo, 1914-19), (Aurobindo, 1914-1921), (Aurobindo, 1950). The philosophy and yoga of Aurobindo was first brought to the West by the Indian philosopher Haridas Chaudhuri (Chaudhuri, 1972), (Chaudhuri, 1953). For a more in-depth summary of Aurobindo’s formulations of Integral Yoga see (Debashish, 2018), and his ‘grand synthesis’ of the evolution of consciousness see (Combs & Krippner, 1999). For a contained description of Aurobindo’s ‘topography of consciousness’ see also (Cornelissen, 2018).

In describing his inner spiritual practices and experiences in ascending to higher states of consciousness, beyond that of the analytic scientific mind, he reports a state of knowledge, or ‘gnosis’, which he called the ‘supramental consciousness’. This can be achieved through a ‘tapasya’—that is, a spiritual effort through a practice he called ‘integral yoga’ (or ‘purna yoga’)—which he described in detail in a huge collection of personal mail exchanged with his disciples (Aurobindo, 1927-50). From that standpoint, he furnishes us, in his works, especially in the ‘Life Divine’ (Aurobindo, 1914-19) and the ‘Synthesis of Yoga’ (Aurobindo, 1914-1921) from a philosophical perspective, and in his epic poem ‘Savitri’ (Aurobindo, 1950) from a more intuitional standpoint, a description of what the universe is and appears to be. Of philosophical interest may also be his collection of essays in (Aurobindo, 1910-1950) and (Aurobindo, 1910-1950b).

For the present discussion that relates to physical sciences, in particular to QP, it might also be useful to mention the research and papers of Ulrich Mohrhoff, a physicist of the Sri Aurobindo International Centre of Education in Puducherry, India. Mohrhoff already focused on particular aspects of QM concerning Aurobindo’s metaphysics.¹ This essay has a somewhat different character, namely, to provide an introduction and a broader overview of the aspects of the metaphysics of Sri Aurobindo relevant to reinterpreting the physical world in general.

Moreover, we extensively quote from Aurobindo’s writings. One could say that the present work is a mix between research and compilation. The reason for this editorial choice can be found in

¹ Some selected papers: (Mohrhoff, 2005), (Mohrhoff, 2007), (Mohrhoff, 2014), (Mohrhoff, 2017), (Mohrhoff, 2018). See also his website: <https://thisquantumworld.com/>

Aurobindo’s powerful, expressive language. His conceptual clarity, paired with a rare linguistic elegance, furnishes us with a source worth a direct read, which literally ‘speaks for itself’.

The present essay is structured as follows.

The first part focuses on Sri Aurobindo’s metaphysics, which describes the perception of the world from the standpoint of a trans-rational cognition. The relation between the Vedantic non-dual teachings, the realization of higher states of consciousness, the spiritual cosmology, and the physical categories such as matter, force, energy, space, and time will be addressed.

In the second part, this knowledge will be shown to be relevant for the understanding of physical reality from the perspective of physics, in particular QP, through an outline of the deeper ontology that, thereby, emerges for phenomena such as quantum entanglement, superposition, the measurement problem, and space-time.

2. Some Aspects of Sri Aurobindo’s Integral Metaphysics

To correctly understand the relationship between Aurobindo’s metaphysics and modern science (here, in particular, physics), it is necessary to present, at least at an introductory level, his integral cosmology. To see how and why his vision is more actual than ever and how it relates to phenomena seemingly so unrelated as quantum physics, it is necessary to become acquainted with the basic concepts and spiritual insights of his metaphysics. The following few paragraphs are by no means, not even nearly, an introduction to his spiritual practice of integral yoga. For that, we defer the reader to the relevant literature cited in the introduction. Here, we provide a brief overview of only those few aspects of his integral cosmology that form a necessary conceptual foundation to understand the scientific considerations we will make in the next sections.

a. The Undifferentiated Oneness: Satcitananda, Supermind and the Overmind

In line with the ancient Indian wisdom of the Veda, also for Sri Aurobindo the universe is a manifestation, self-expression, and self-creative process of a supreme reality, Brahman, the transcendent Self, or Satcitananda (‘Existence-Consciousness-Bliss’). All is Brahman, the ultimate supra-cosmic Entity, the ‘One without a second’, the only true existing Being, which is at once an eternal immutable and yet dynamic reality. However, while for the non-dual philosophy of Advaita Vedanta anything else is a cosmic ‘illusion of Maya’, or the ‘veil of Avidya’, Aurobindo does not consider the world of temporal manifestation as an illusion or something from which we should escape. His cosmology is an extension of the original Vedic and Vedantic tradition to what we may call an ‘integral realist Vedanta’.

The world is a differentiated unity, a manifold oneness generating infinite variety. The universe is a “*force of being throwing itself out in action, energy at work*”, as Aurobindo used to say (Aurobindo, 1914-19, pp. 474, bk. II, ch. VI).

What to our ordinary mind might sound like a mere contradiction, an absurd play of words, according to several mystics, becomes a natural state of affairs when reality is experienced from higher states of consciousness. The seer realizes that between our human mind and this ‘divine consciousness’, several planes exist; Aurobindo systematized them in the ‘higher hemisphere’ of planes of consciousness as the ‘higher mind’, the ‘illuminated mind’, the ‘intuitive mind’, the ‘overmind’, the ‘Supermind’ or ‘divine Gnosis, and Satcitanada.

In Aurobindo’s integral cosmology, it is the Supermind that is the representative consciousness in the manifestation of a transcendent Oneness. The Supermind is not the cause of the cosmic differentiation; however, it is, so to speak, the ‘emanation’ of the indivisible Brahman as the first form of supra-cosmic consciousness that can contain both unity and polarity at the same time. If the ultimate transcendent reality is an undifferentiated Oneness, how and why do we observe a universe of polarities and division?

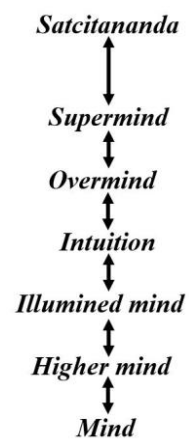


Fig. 1 The planes of consciousness beyond mind according to Sri Aurobindo’s metaphysics.

“Supermind therefore proceeds by a double faculty of comprehensive and apprehensive knowledge; proceeding from the essential oneness to the resultant multiplicity, it comprehends all things in itself as itself the One in its manifold aspects and it apprehends separately all things in itself as objects of its will and knowledge. While to its original self-awareness all things are one being, one consciousness, one will, one self-delight and the whole movement of things a movement one and indivisible, it proceeds in its action from the unity to the multiplicity and from multiplicity to unity, creating an ordered relation between them and an appearance but not a binding reality of division, a subtle unseparating division, or rather a demarcation and determination within the indivisible. The Supermind is the divine Gnosis which creates, governs and upholds the worlds: it is the secret Wisdom which upholds both our Knowledge and our Ignorance.” (Aurobindo, 1914-19, pp. 277, bk. I, ch. XXVII)

While the supramental consciousness can apprehend unity and diversity, transcending them both, in the manifesting physical universe it is not yet the effectuating power, and maintains itself only indirectly active behind the ‘veil’ of an apparently unconscious manifestation. The causal power immanent in the universal play is the overmind, which constitutes the first step in the manifestation of dualities.

“In Overmind, in all the higher ranges of the mind, we find recurring the dichotomy of a pure silent self without feature or qualities or relations, self-existent, self-poised, self-sufficient, and the mighty dynamis of a determinative knowledge-power, of a creative consciousness and force which precipitates itself into the forms of the universe.” (Aurobindo, 1914-19, pp. 325, bk. II, ch. I) – *In this simultaneous development of multitudinous independent or combined Powers or Potentials there is yet—or there is as yet—no chaos, no conflict, no fall from Truth or Knowledge.”* (Aurobindo, 1914-19, pp. 297, bk. I, ch. XXVIII)

But overmind is also the limit and border between a divine omniscience and a realm that begins to manifest the first signs of a descent into self-forgetfulness.

“Overmind in its descent reaches a line which divides the cosmic Truth from the cosmic Ignorance; it is the line at which it becomes possible for Consciousness-Force, emphasising the separateness of each independent movement created by Overmind and hiding or darkening their unity, to divide Mind by an exclusive concentration from the overmental source.” (Aurobindo, 1914-19, pp. 300, bk. I, ch. XXVIII) *“Overmind Energy proceeds through an illimitable capacity of separation and combination of the powers and aspects of the integral and indivisible all-comprehending Unity, Overmind is an organizer of many potentialities of existence”* (Aurobindo, 1914-19, pp. 297, bk. I, ch. XXVIII).

But what is ‘ignorance’? Of course, we mean not the lack of bookish intellectual knowledge but, rather, the lack of awareness and intuitive knowledge. Aurobindo not only means the individual ignorance of our stumbling and imperfect mind but also points at a cosmic ignorance. The Supermind and the overmind are still planes of being and universal existence which fully contain the Consciousness, Knowledge, and Ananda (Bliss) of the original Source from which they derive, but the overmind is the demarcation line between a divine existence and a universe of separation, dualities and loss of self-consciousness. “[...]: it is in Overmind a golden lid which hides the face of the supramental Truth but reflect its image; in Mind it becomes a more opaque and smoky-luminous coverture.” (Aurobindo, 1914-19, pp. 614, bk. II, ch. XIII).

b. The Principle of Division: Cosmic Mind, Mind and Ignorance

At bottom, ignorance is a process of exclusion from the One. It is the result of something divine that detaches from itself and loses contact with itself and, therefore, its own divinity.

“Since Brahman is in the essentiality of its universal being a unity and a multiplicity aware of each other and in each other and since in its reality it is something beyond the One and the Many, containing both, aware of both, Ignorance can only come about as a subordinate phenomenon by some concentration of consciousness absorbed in a part knowledge or a part action of the being and excluding the rest from its awareness. There may be either a concentration of the One in itself to the exclusion of the Many or of the Many in their own action to the exclusion of the all-awareness of the One, or of the individual being in himself to the exclusion both of the One and the rest of the Many who are then to him separated units not included in his direct awareness. Or again there may be or there may intervene at a certain point some general rule of exclusive concentration, operative in all these three directions, a concentration of separative active consciousness in a separative movement; but this takes place not in the true self, but in the force of active being, in Prakriti.” – Ignorance “is the outcome of some

particularizing action in the executive Conscious-Force when it is absorbed in its works and forgetful of self and of the total reality of the nature.” This concentration of consciousness is a “*single-pointed concentration [of the infinity of being] in one centre or an absorption in one objective form of its self-existence*”. (Aurobindo, 1914-19, pp. 602, bk. II, ch. XIII).

This ‘self-concentration’ of the Infinite is a central aspect of Aurobindo’s cosmology. It is a primeval act that manifests on all levels below the unitary consciousness of the supermind. In our mind as a mental act with the characteristic property of ‘intending’ or ‘being about’ an object in its mental dimensionality—something the German philosopher, psychologist and Catholic priest Franz Brentano called ‘intentionality’. This peculiar mental property and activity of our mind that Edmund Husserl and Jean-Paul Sartre extensively wrote about. But also in line with a Whiteheadian process philosophy. For Aurobindo, intentionality isn’t an emergent brain activity but, to the contrary, the original activity of a cosmic Mind. Intentionality is something inherent in the nature of all the dynamic universe itself. It is not an epiphenomenon arising from the processes of a brain; rather, it is already the very essential process of a divinity in the spatial-temporal reality.

From this perspective, the material universe we see with our human sensory and mental standpoint is, in reality, an undifferentiated Being that, however, takes a step back, so to speak, and objectifies itself in an infinity of spatial and temporal distinctions we call ‘particles’, ‘forces’, ‘energy’ and, more generally, determinations of all sort and that make up our experience of this Universe. It is a metaphysical process that relates an Absolute, whose main characteristic is a perfect Unity, a One without a second, to an infinitely varied multiplicity of distinguishable objects with an infinite variety of properties. A indivisible all-comprehending Oneness that becomes a multiplicity.

For Aurobindo, this separating principle is a cosmic or universal Mind which is an emanation of the overmind. But, while the overmind is aware and conscious of its divine nature and supramental source, the cosmic Mind has definitely lost this original contact and is the first step of a universal consciousness into ignorance. Meanwhile, the distinctive character of the cosmic ignorance in which the cosmic Mind finds itself is that it conceives and creates duality, acting in terms of division, separation and distinction—what Sri Aurobindo called a ‘self-forgetful multiple exclusive concentration’ and expressing itself in itself by a phenomenal division. This process of universal ‘self-limitation’, is something that was also pointed out recently in the philosophy of mind by Swami Medhananda’s comparative analysis of Aurobindo’s cosmology with cosmopsychism. (Medhananda, 2022)

“The cosmic Mind on this level, no doubt, comprehends its own unity, but it is not aware of its own source and foundation in the Spirit or can only comprehend it by the intelligence, not in any enduring experience; it acts in itself as if by its own right and works out what it receives as material without direct communication with the source from which it receives it.” (Aurobindo, 1914-19, pp. 300, bk. I, ch. XXVIII).

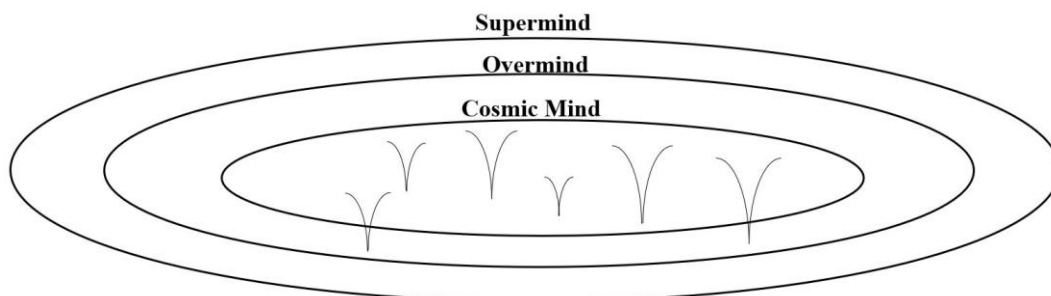


Fig. 2 The exclusive self-concentration of the cosmic Mind creating a universe of dualities.

That’s where our mental consciousness comes from. According to Aurobindo, the human mind is a portion, a selection, a localized patch of the cosmic Mind and, thereby, conserves its inherent qualities and limitations. *“But Mind by its very nature tends to know and sense substance of conscious-being, not in its unity or totality but by the principle of division. It sees it, as it were, in infinitesimal points which it associates together in order to arrive at a totality, and into these view-points and associations cosmic Mind throws itself and dwells in them”* (Aurobindo, 1914-19, pp. 252, bk. I, ch. XXIV). *“For Mind is essentially that faculty of Supermind which measures and limits, which fixes a particular centre and*

views from that the cosmic movement and its interactions.” (Aurobindo, 1914-19, pp. 282, bk. I, ch. XXVII). “Thus the knowledge of distinctions arrives at its greatest truth and effective use when we arrive at the deeper knowledge of that which reconciles distinctions in the unity behind all variations.” (Aurobindo, 1914-19, pp. 396, bk. II, ch. III).

This concentration is the root of what Aurobindo means by ‘ignorance’, because “if the consciousness erects by the concentration a wall of exclusion limiting itself to a single field, domain or habitation in the movement so that it is aware only of that or aware of all the rest as outside itself, then we have a principle of self-limiting knowledge which can result in a separative knowledge and culminate in a positive and effective ignorance.” (Aurobindo, 1914-19, pp. 604, bk. II, ch. XIII).

That’s why the mind, with its separative power that creates distinctions and classification, is still a tool of the domain of ignorance.

“Mind as we know it is a power of the Ignorance seeking for Truth, groping with difficulty to find it, reaching only mental constructions and representations of it in word and idea, in mind formations, sense formations—as if bright or shadowy photographs or films of a distant Reality were all that it could achieve. Supermind, on the contrary, is in actual and natural possession of the Truth and its formations are forms of the Reality, not constructions, representations or indicative figures.” (Aurobindo, 1914-19, pp. 286, bk. I, ch. XXVIII).

“Essentially, in the universal order of things, the inconscience of material Nature is the same exclusive concentration, the same absorption in the work and the energy as in the self-limitation of the waking human mind, or the concentration of the self-forgetting mind in its working; it is only that self-limitation carried to a farthest point of self-forgetfulness which becomes, not a temporary action, but the law of its action” (Aurobindo, 1914-19, pp. 611, bk. II, ch. XIII).

In Aurobindo’s psychology, consciousness and mind are not conflated as synonymous. Consciousness in its ultimate essence and nature is the undifferentiated Self; the mind is only a middle term of an ascending and descending ladder of consciousness in the manifestation. “Necessarily, in such a view, the word consciousness changes its meaning. It is no longer synonymous with mentality but indicates a self-aware force of existence of which mentality is a middle term; below mentality it sinks into vital and material movements which are for us subconscious; above, it rises into the supramental which is for us the superconscious. But in all it is one and the same thing organising itself differently.” (Aurobindo, 1914-19, pp. 96, bk. I, ch. X).

c. Matter as Extreme Fragmentation of the Infinite

How does the cosmology described in the previous section relate to physical reality? When we speak of ‘reality’ in physics, we mainly mean matter, forces and its space-time background manifold. Let us begin with the metaphysical notion of matter as seen from the seer who has attained higher states of consciousness.

Matter presents itself to us, in its sensible form, as solid stuff whose main trait is that it is discernible by distinction. When we speak of a material particle, we mean a center of force that must be distinguished from another center of force in space and time. But the appearance of division and fragmentation inherent in matter reflects a deeper principle.

Matter is “an extreme fragmentation of the Infinite.” - “[...] the nature of the action of cosmic Mind is the cause of atomic existence” – Since mind knows only by a principle of division “Matter is substance of the one conscious-being phenomenally divided within itself by the action of a universal Mind²—a division which the individual mind repeats and dwells in, but which does not abrogate or at all diminish the unity of Spirit or the unity of Energy or the real unity of Matter.” – “Therefore, the inconscience, the inertia, the atomic disaggregation of Matter must have their source in this all-dividing and self-involving action of Mind by which our universe came into being.” (Aurobindo, 1914-19, pp. 250, bk. I, ch. XXIV).

A universal Mind (with capital letter M) that has precipitated itself into material existence. Matter is not the ultimate foundation but itself a form created by an all-dividing Mind.

² “Mind is here used in its widest sense including the operation of an Overmind power which is nearest to the supramental Truth-Consciousness and which is the first fountain of the creation of the Ignorance.” – (Footnote in the original.)

From Aurobindo's perspective this explains why, in science, reductionism was so successful. It is because, on the one hand, this 'atomic existence' is caused by—and is inherent to—the very same cosmic Mind and has, therefore, a reality on its own. On the other hand, it is also naturally inherent to the human mind, because it is itself an individuation, a conscious center of the very same cosmic Mind. The intellectual property to reduce, distinguish and section with mathematics and physical sciences is an inherited trait of our minds from this 'Mind at large', as Aldous Huxley used to call it (Huxley, 1954).

"Matter therefore is the last stage known to us in the progress of pure substance towards a basis of cosmic relation in which the first word shall be not spirit but form, and form in its utmost possible development of concentration, resistance, durably gross image, mutual impenetrability,— the culminating point of distinction, separation and division. This is the intention and character of the material universe; it is the formula of accomplished divisibility" (Aurobindo, 1914-19, pp. 267, bk. I, ch. XXVI) - *"Therefore we arrive at this truth of Matter that there is a conceptive self-extension of being which works itself out in the universe as substance or object of consciousness and which cosmic Mind and Life in their creative action represent through atomic division and aggregation as the thing we call Matter"* (Aurobindo, 1914-19, pp. 253, bk. I, ch. XXIV).

Thus, the two poles come together and, from this perspective, we might find a natural explanation for the effectiveness of mathematics in natural science. Because science is a quantitative mental discipline, with quantity being the counting of separate and distinguishable objects, that we abstractly represent with numbers.

By the dividing action of the Cosmic Mind, Satcitananda has become an infinite variety and yet maintains its transcendent unity. Brahman is the 'One without the second' of the Vedanta tradition and which is all there is, while matter is an 'exclusive self-concentration' of the cosmic Mind. That cosmic Mind is itself a representative in the temporal manifestation of that same Brahman. Our mind is also an individualized center of it, meaning that, deep down, our contact with matter is a contact of Someone with itself. Paraphrasing Aurobindo, Matter is substance of conscious-being, a form of the force of conscious Being, cast into form, into a figured self-representation of Satcitananda:

"Matter is the form of substance of being which the existence of Satcitananda assumes when it subjects itself to this phenomenal action of its own consciousness and force." (Aurobindo, 1914-19, pp. 277, bk. I, ch. XXVII) – *"Matter is Satcitananda represented to His own mental experience as a formal basis of objective knowledge, action and delight of existence."* (Aurobindo, 1914-19, pp. 253, bk. I, ch. XXIV) – *"Substance, then, as we know it, material substance, is the form in which Mind acting through sense contacts the conscious Being of which it is itself a movement of knowledge."* (Aurobindo, 1914-19, pp. 252, bk. I, ch. XXIV) *"Substance is the form of itself [a secret Consciousness and Will] on which it works, and of that substance if Matter is one end, Spirit is the other. The two are one: Spirit is the soul and reality of that which we sense as Matter; Matter is a form and body of that which we realise as Spirit."* (Aurobindo, 1914-19, pp. 255, bk. I, ch. XXV) Deep down, the mystical nature of the physical universe *"... is the immortal and infinite Spirit that has veiled itself in the dense robe of material substance and works there by the supreme creative power of Supermind, permitting the divisions of Mind and the reign of the lowest or material principle only as initial conditions for a certain evolutionary play of the One in the Many."* (Aurobindo, 1914-19, pp. 264, bk. I, ch. XXV)

d. The Conscious-Force and Consciousness-Will

The fundamental categories of physics from which everything else is derived are matter, force, energy, space and time, or space-time. In fact, the physical universe can, at least in principle, be described by modern physics in terms of these fundamental entities. Force and energy have a precise definition in physics (such as the change of the momentum in time of a body and the capacity of a body to perform work, respectively). But definitions, as rigorous as they might be, do not usually say much about the essence of the objects we are talking about. Their ontology remains obscure. Also, as A.N. Whitehead recognized, physics is about processes, not about the essence and ultimate reality of those processes. Physicists study the how and why of the fundamental forces and energies but do not care about what these forces and energies ultimately are. And it cannot be otherwise if we accept that we are looking at things from a limited consciousness. For example, take electricity or gravity. We can describe the phenomenon quite well: Once given the initial and boundary conditions of a particle or a system and the forces that act dynamically on it, we can predict its temporal evolution by solving a set of differential

equations. But all these laws and principles, cast into an abstract mathematical formalism, tell us only how these forces act; they do not tell us much about what, ultimately, electricity and gravity are. That is why Newton famously declared *'hypotheses non fingo'* ('I frame non-hypotheses') when asked about the nature of gravity.

In physics, four fundamental forces are known, namely, the electromagnetic, the gravitational force, and the two nuclear forces. If we go beyond the mere mathematical abstraction, their working can, loosely speaking, be described as an action of change and also that of permanence, stability, the immutability of material structures. Force is an action that produces a change in time or keeps aggregates like particles, atoms, and molecules tight together to give form to things, while energy is a measure of the potentiality to bring about this change.

Meanwhile, from the highest standpoint, according to Aurobindo, while matter in form of a static and inert force appears as an extreme fragmentation of the Infinite, the dynamical forces also arise as 'self-concentrations' and 'self-diffusion' of Something into Itself.

"All phenomenal existence resolves itself into Force, into a movement of energy that assumes more or less material, more or less gross or subtle forms for self-presentation to its own experience." – "[...] Force is thus inherent in existence and it is the nature of Force to have this double or alternative potentiality of rest and movement, that is to say, of self-concentration in Force and self-diffusion in Force" – "[...] an eternal self-concentration of Force in immutable existence." (Aurobindo, 1914-19, pp. 90, bk. 1, ch. X) – *"The power of the self has the appearance of a Force."* (Aurobindo, 1914-19, pp. 362, bk. 2, ch. II)

On the lines of A. Schopenhauer who envisaged the 'World as Will', also Aurobindo points at the metaphysical centrality of a 'World-Will' being the source and expression of all energies and physical forces: *"The Energy that creates the world can be nothing else than a Will, and Will is only consciousness applying itself to a work and a result."* (Aurobindo, 1914-19, pp. 17, bk. 1, ch. I) – *"The first terms of Life are division, a force driven subconscious will, apparent not as will but as dumb urge of physical energy, and the impotence of an inert subjection to the mechanical forces that govern the interchange between the form and its environment"* (Aurobindo, 1914-19, pp. 211, bk. 1, ch. XXI) But that impotence of an inert subjection hides the Supermind which *'is present, even though concealed, in every form and force of the universe.'* (Aurobindo, 1914-19, pp. 145, bk. 1, ch. XV).

Thus, Aurobindo sees what we call 'physical forces' and 'energy', as the masks of a veiled consciousness in action in the spatio-temporal manifestation. The processes in our cosmos are self-presentations of It in Itself, and what we would represent in conventional physical terms as attractive and repulsive forces are self-concentrations and self-diffusions in Force which are always the expression of a mechanical self-forgetful and subconscious will.

e. Space, Time and the Supramental Time-Vision

Aurobindo's vision was an account of a first-person mystic experience. He claimed that from the heights of the supramental consciousness, one no longer realizes physical reality as a dynamic unfoldment of time-successions; rather, it is an action of a timeless and changeless eternal Being. From Supermind, everything is a pure, featureless, causeless, eternal Absolute—a changeless and a-temporal Infinite that does not create but, rather, manifests itself in itself through self-determinations in time and space, though remaining above that very same time and space: An 'eternity in motion-status'.

From this perspective, space and time appear neither as separate entities nor as separable aspects of the Infinite, but as 'self-extensions'. Space and time are, from the view of the supramental consciousness, an objective and subjective extension of Itself, not some independent and separated given that exist by themselves alone. Space is an objective self-extension of the Brahman in the Brahman while time is its own subjective self-extension. Objective in the sense that this infinite Consciousness steps back, so to speak, and becomes an object of experience of itself, and subjective in the sense of a qualitative experience of a supra-cosmic Consciousness of itself. After all, it could not be otherwise, as there is nothing else beyond that Consciousness which is One without a second and at the same time is extreme variety in multiplicity.

"The original status is that of the Reality timeless and spaceless; Space and Time would be the same Reality self-extended to contain the deployment of what was within it. The difference would be, as in all

the other oppositions, the Spirit looking at itself in essence and principle of being and the same Spirit looking at itself in the dynamism of its essence and principle. Space and Time are our names for this self-extension of the one Reality. We are apt to see Space as a static extension in which all things stand or move together in a fixed order; we see Time as a mobile extension which is measured by movement and event: Space then would be Brahman in self-extended status; Time would be Brahman in self-extended movement. But this may be only a first view and inaccurate: Space may be really a constant mobile, the constancy and the persistent time-relation of things in it creating the sense of stability of Space, the mobility creating the sense of time-movement in stable Space. Or, again, Space would be Brahman extended for the holding together of forms and objects; Time would be Brahman self-extended for the deployment of the movement of self-power carrying forms and objects; the two would then be a dual aspect of one and the same self-extension of the cosmic Eternal.” (Aurobindo, 1914-19, pp. 375, bk. 2, ch. II)

While space appears to us as an objective property of the external physical world that we perceive, we intuitively experience time as something subjective and less material. From the perspective of a higher consciousness, Sri Aurobindo describes these two conceptual entities as follows. Thus, for Aurobindo, the question of the reality of space and time is answered: The physical space-time is a fundamental spiritual reality. These are not unreal figments of our mind but, rather, immaterial and spiritual extensions that our mind cannot capture. To become aware of this fundamental reality, one must step back from mental conceptualizations and see things from a deeper state of consciousness by an inward motion. Space and time become relative entities, and fundamentally spiritual in its essence.

“In any case, if Spirit is the fundamental reality, Time and Space must either be conceptive conditions under which the Spirit sees its own movement of energy or else they must be fundamental conditions of the Spirit itself which assume a different appearance or status according to the status of consciousness in which they manifest. In other words there is a different Time and Space for each status of our consciousness and even different movements of Time and Space within each status; but all would be renderings of a fundamental spiritual reality of Time-Space.” – “Subjectivity and objectivity are only two sides of one consciousness, and the cardinal fact is that any given Time or Space or any given Time-Space as a whole is a status of being in which there is a movement of the consciousness and force of the being, a movement that creates or manifests events and happenings; it is the relation of the consciousness that sees and the force that formulates the happenings, a relation inherent in the status, which determines the sense of Time and creates our awareness of Time-movement, Time-relation, Time-measure. In its fundamental truth the original status of Time behind all its variations is nothing else than the eternity of the Eternal, just as the fundamental truth of Space, the original sense of its reality, is the infinity of the Infinite.” (Aurobindo, 1914-19, pp. 376, bk. 2, ch. II)

Time and space are spiritual extensions of the same entity; however, our mind renders them into two differentiated ‘fields’. Subjectivity and objectivity are themselves the two polarities of the same consciousness. Space-time are mental relations of the consciousness inherent in a ‘status of being’. Eternity and infinity are the original statuses of time and space, respectively. Time, as we know it, from our limited mind-consciousness, results only in an artificial shadow of a much deeper truth about space, time and the phenomenal universe. An eternal time consciousness that has a total and unified vision of actualities, which goes far behind our mentality and where permanence or representations are thrown up by the eternity of Supermind into an indivisible continuity of time vision.

Equally illusionary is our distinction of time in past, present, and future. From the highest spiritual perspective, one enters the threefold supramental vision of time, ‘trikaladrsti’.

“The mind knows only the present and lives in an isolated movement of it though it tries to remember and retain the past and forecast and compel the future. The supermind has the vision of the three times, trikaladrsti, it sees them as an indivisible movement and sees too each containing the others. It is aware of all tendencies, energies and forces as the diverse play of unity and knows their relation to each other in the single movement of the one spirit.” (Aurobindo, 1914-1921, pp. 792, Pt. IV, ch. XIX)

This infinite time consciousness is “founded first on its eternal identity beyond the changes of time, secondly on a simultaneous eternity of Time in which past, present and future exists together for ever in the self-knowledge and self-power of the Eternal, thirdly, in a total view of the three times as one movement singly and indivisibly seen even in their succession of stages, periods, last – and that only in

the instrumental consciousness – in the step by step evolution of the moments.” (Aurobindo, 1914-1921, pp. 886, Pt. IV, ch. XXV)

The unified infinite time consciousness of the timeless Infinite “*maintains in itself at once in a vision of totalities and of particularities, of mobile succession or moment sight and of total stabilising vision or abiding whole sight what appears to us as the past of things, their present and their future.*” (Aurobindo, 1914-1921, pp. 905, Pt. IV, ch. XXV)

An eternal time-consciousness beyond our mentality capable of a total and unified vision of actualities in a timeless and changeless eternity of a pure causeless and featureless One Existence of which we can apprehend only artificial shadow projections—that is, permanences or representations thrown up by the eternity of Supermind into an indivisible continuity of time vision where past, present, and future are one.

This concludes the section dedicated to Aurobindo’s spiritual metaphysics. We furnished an essential description that connects his mystic vision with material reality. With this foundation, we can now reconceptualize physical sciences in the frame of this integral cosmology.

3. The Metaphysics of Quantum Physics

In this section, we would like to reinterpret the ontology of modern physics, with a particular view to quantum physics and relativity, from the standpoint of the aforementioned integral metaphysics. This might place our understanding, and especially our inner perception with which we look upon the world, on a different footing. Taking this comprehensive trans-rational and metaphysical perspective also in exact and reductionist science might help us to widen our horizons and see the world with a different eye.

a. Quantum Superposition, Entanglement, and Nonlocality

We have seen how, according to Aurobindo’s psychology, the special character of the mind is its cognitive activity of separation, division, and fragmentation. The mind knows only by a principle of division, which binds infinitesimal points and associates them in a bottom-up vision but is unable to grasp wholistically the One which is neither one nor the many but something that transcends both.

This might sound very far from our everyday experience. Or, perhaps not, if we can take a little step inward towards an intuitive understanding of things. At any rate, we find suggestive parallels of Aurobindo’s metaphysical wholism in quantum phenomena: The quantum superposition and entanglement phenomenon.

Before a measurement, a particle can be in a superposition state—that is, it can be considered in two or more different states that in our macroscopic understanding of the world are mutually exclusive, such as being in two places at the same time³ or having opposite spins (intrinsic angular momentum) and that must be described by a single-state wavefunction⁴. But even this representation is only a convenient picture that satisfies our naïve intuition. In reality, the message that Nature is trying to convey to us through QP is deeper. There are not two particles to begin with. There is nothing in two places at the same time; rather, there is only a potentiality that a measurement presents one interaction in a specific position at a specific time. At the instant of measurement, we are left with a particle at only one precise

³ The typical example comes from Heisenberg’s principle of uncertainty, which states that the precision with which a measurement yields the position of a particle is inversely proportional to our knowledge over its momentum. This uncertainty is not a statement about empirical limits or human’s ignorance but means the particle has no precise position. The other example is illustrated by the famous wave-particle duality with the double slit experiment. One particle described by a wave is diffracted by two slits—that is, the particle seems to go through the two slits at the same time—and, if many particles are involved, a characteristic pattern of interference fringes on a detecting screen appears.

⁴ The wavefunction is an abstract mathematical tool that physicists use to describe the probability that a specific value of a dynamical variable will obtain due to a measurement (e.g., the position or spin of a particle). Before the measurement, it describes probabilistically a range of all possible outcomes (say, a space interval where the particle could be found). Once a measurement is done and only one value is registered (say, the position of a particle), it is customary to say that the wavefunction has ‘collapsed’ to that value.

position and that, in hindsight, by a counterfactual definiteness, we reify as what we like to call a ‘particle’.

Whereas, two particles are said to be entangled when they behave not as two but as one undifferentiated entity even if separated by a large distance and, again are described by a unique wavefunction spreading throughout space. Any attempt to conceptualize an entangled quantum system in terms of the sum of its sub-components is inconsistent and leads to contradictions. However, after the act of measurement, the two distinct particles decohere—that is, lose their entangled quantum state—and acquire definite and correlated states.

It looks like Nature is telling us to never consider matter as made of single particles but, rather, as the expression and manifestation of a single holistic unit. Quantum entanglement, indeed, seems to suggest to us that separation, division, fragmentation, and distinction are not inherent to the ultimate reality but, rather, emerge as an illusion, a sort of epiphenomenon arising because of observation. In fact, this separation into distinguishable particles comes into being only at the instant of interaction with a detector, what we call the ‘measurement’. But before that instant, the entangled particles are not particles at all; they are only a quantum system described by a wavefunction that extends itself throughout space and does not distinguish between one or another particle.

This means that there is a dichotomy between a quantum system before it is measured and after the measurement. The act of measurement determines the quantum collapse of the wavefunction instantaneously: from a wave to a point-particle, or from an entangled unique state to a non-entangled system of particles which instantly acquire definite and correlated states despite being separated by large distances. This is the notion of quantum nonlocality, whereby one can have particles seemingly connected and apparently interacting with what Einstein called a “spooky action at a distance”. But, in reality, there are no ‘actions’ or ‘interactions’ at a distance, there are only correlations (or anti-correlations) between particles, such as a particle having a clockwise-spin and the other anti-clockwise spin. The question is not what ‘acts’ at a distance, rather how does possibly a correlation come into existence without any interaction? It is as if a wholistic unit suddenly shrinks into a set of differentiated force-centers that we call ‘particles’—a differentiation and infinite multiplicity that deploys but does not destroy the unity. Difficult to grasp for the ordinary separateing mental consciousness but in line with Aurobindo’s supramental vision. *“For the Supermind is the Vast; it starts from unity, not division, it is primarily comprehensive, differentiation is only its secondary act”* (Aurobindo, 1914-19, pp. 139, bk. 1, ch. XIV).

A quantum principle of indistinguishability holds, and that does not allow for the particle to have a definite state until observed. In QM, the ‘principle of indistinguishability’ states a stronger version of a lack of distinctiveness than what we have in classical mechanics. In the quantum realm, two particles of the same type are not indistinguishable only because they have the same properties. As long as they are not subjected to measurement, they are really the same relation-less and indistinguishable entity. For example, in classical mechanics, two colliding identical bodies can still be distinguished if one follows their scattering trajectories (see Fig. 3).

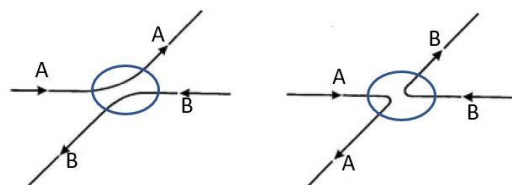


Fig. 3 The two possible classical scatterings between two identical bodies: they are still distinguishable if one follows their path.

Whereas, in a quantum scattering process between two identical particles, once they collide with each other, they will form an undifferentiated and unique whole described by an outgoing wavefront where the classical distinguishability is lost (see Fig. 4).

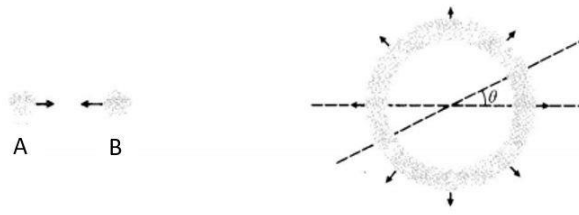


Fig. 4 *Quantum scattering between two identical particles: the two particles lose their identity and coalesce into an undifferentiated and unique outgoing wavefront.*

That is what, according to Richard Feynman, prompted John Archibald Wheeler to tell him in a telephone call: "*Feynman, I know why all electrons have the same charge and the same mass.*" "*Why?*" "*Because, they are all the same electron!*" (Feynman, 1965).

It appears that it is only at the instant of measurement that their distinctiveness comes into being by a differentiation that establishes a relation between the two separate particles. What we imagine as 'particles' are only a convenient but naïve form-representation of something formless. From the perspective of the metaphysical cosmology described so far, forms and shapes are representations of Something beyond forms and shapes in Itself. It is only our mentality that is unable to go beyond the dualities and sees differences and distinctions which, however, are figments, shadows, or projections of Something that has no such differentiations in its ultimate and fundamental Nature. Or, to put it in other words, the very concepts of difference and sameness are only the two side aspects of an Entity that can be both and is beyond both.

This continues to evade any mental rational understanding based on our separative spatial and temporal consciousness, which is based on a spatio-temporal ordered division and differentiation of reality. But it acquires an almost obvious meaning if we accept that everything is a spatial and temporal manifestation of something, which is a time-less Being without distinctions, which, however, creates in itself a multitude by localizing itself in space and time through what Sri Aurobindo called the 'exclusive concentrations' of a cosmic Mind working by division and fragmentation through processes of self-determination. So, the infinite number of particles that we observe and that build up our universe by a hierarchical bottom-up process are, at the same time, multiple exclusive concentrations of a fragmenting cosmic Consciousness which, however, is also a delegate of the overmind and, lastly, the Supermind which is the utmost unitary and uniting power that could conceivably exist. This dichotomy between polarity and unitarity displays itself in our mental-scientific vision in the form of these quantum effects that we perceive as separate particles and that, paradoxically, can be described only by a wavefunction as an inseparable whole.

Therefore, we might interpret quantum superposition and entanglement and the collapse of the wavefunction the other way around. Quantum entanglement is the original and almost constant present state of all matter, whereas its appearance as separated and divided particles is the instantaneous action of a dividing cosmic Mind. It is this cosmic but microscopic differentiation, individuation, and self-limitation by the exclusive concentration of a cosmic Mind in itself whereby an undivided unity apparently ceases to exist, creating the illusion of substance and a divided existence.

b. Quantization

What QP is all about are, as the name suggests, quanta. Quanta are responsible for the atomicity of Nature and all the micro-physical processes. The founder of QP, the German physicist Max Planck, introduced the idea of energy being quantized in 1905. This discreteness manifest in the physical universe, of which the most typical example is the light quanta, the photon, also exists for other dynamic variables—besides energy, for spin, angular momenta, mass, magnetic momenta, etc. All are quantized physical properties and determine processes among elementary particles, in atomic nuclei, in atoms, and molecules. . From the perspective of Aurobindo, the dividing cosmic Mind leads not only to a granular material universe in terms of particles, atoms and molecules, but also of all physical properties of matter, space, time and forces. This quantization of the universe arises due to the combination of the wave-nature of particles and the particles being themselves concentrated and localized force-centers. For example, that is how atoms form: Electron wave-packets fill a potential well and, thereby, form around

a nucleus standing probability waves that can acquire only discrete—that is, quantized—energy states. But, without the individuation of these force-centers by the ‘exclusive concentrations’ of the cosmic Mind creating the particles we observe, this quantization could not have taken place. It is this latter process of fragmentation caused by a cosmic Mind, which leads to the granularity of the physical world we observe, in for of an ‘atomic existence’.

c. Quantum Vacuum and the Modes of Existence

Suggestive is how all this might relate to the concept of the quantum vacuum. In QP, there is no such thing as empty space, not even when a volume of space is emptied of all matter and radiation. According to quantum field theory (QFT), a vacuum at an absolute zero temperature must be conceived as a foam of quantum fluctuations or, stated more precisely, the quantum expectation value of the energy state of the vacuum represented by harmonic oscillators, the so-called ‘zero-point energy’. It is a quantum potentiality where, because of Einstein’s energy-matter equivalence, ‘virtual particles’ are conceived as coming and going in and out of existence for extremely brief time intervals as far as the time-energy uncertainty principle allows.⁵ This idea that something dynamically appears and disappears just out of ‘nothing’ is quite hard to accept, and yet physicists were forced to introduce it in their calculations (and employ it routinely in the formal construct that Feynman diagrams⁶ represent) because only by implementing this into their theoretical construction could the standard model of particle physics work successfully.

But if we accept Aurobindo’s point of view, we see how all this seemingly ghostly virtual reality of particles coming and going throughout the volume of the entire universe as an immense quantum foam is a quite natural working of a cosmic consciousness that, with its “extreme fragmentation of the Infinite”, particularizes itself in an ever-present exclusive self-concentration of itself in space and time. It is a permanent manifestation of a succession of multiple localized actions of a universal consciousness in the form of forces, energies, and movements coming and going: “...an *alternative rhythm of rest and movement succeeding each other in Time or else as an eternal self-concentration of Force in immutable existence with a superficial play of movement, change and formation like the rising and falling of waves on the surface of the ocean.*” (Aurobindo, 1914-19, pp. 90, bk. I, ch. X)

This also means that there is no ‘popping in and out of existence’ of particles, as it is frequently portrayed in the popular media. This is the activity of a creative universal Mind in every space-time point. It is this action of the cosmic Mind in itself throughout the cosmic extension that produces a ‘rising and falling of waves on the surface of the ocean’ and that, to the ordinary human mind, appears to be an extremely fast coming into being followed by an almost immediate disappearance into nothingness. In this supramental vision, however, all of that appears as a sort of ‘phase transition’, not a creation or annihilation ex or into nihilo—something reminiscent of Spinoza’s many ‘modes’ of the primordial ‘substance’, or just ‘Nature’. It is the dual-aspect monism of the philosopher of mind that contends that everything is only one substance but that presents itself in the manifestation with different modes. Mind and matter are not two separate and unrelated entities but, rather, are the two modes of the same substance, the ‘res extensa’ and ‘res cogitans’. Not to confuse this, however, with a Cartesian dualism that conceives of only these two ‘states’ and as separated and unconnected ‘substances’ (res). In the aurobindonian cosmology, all is the same substance and yet it can have several modes, each corresponding to a plane of existence, as represented in the vertical scale of Fig. 1.

“Mind and Matter are rather different grades of the same energy, different organisations of one conscious Force of Existence.” – “And in the operations of inanimate Nature we find the same pervading characteristic of a supreme hidden intelligence, ‘hidden in the modes of its own workings’.” (Aurobindo, 1914-19, pp. 96, bk. I, ch. X)

⁵ Loosely speaking, the time-energy uncertainty principle states that the uncertainty over the energy of a measurement is inversely proportional to the time that the measurement lasts. If one takes an extremely fast measurement, there is no way around getting a high degree of uncertainty over the measured energy, and vice versa.

⁶ Feynman diagrams are a figurative way to represent some special calculations in QFT that are necessary to determine scattering processes between interacting particles. In Feynman diagrams, forces themselves are represented as an exchange of force-mediating particles between interacting particles.

d. The Measurement Problem

Quantum mechanics developed in the last century into a theory that describes quite well the phenomena of the microscopic world (molecules, atoms, nuclei, and particles). Nevertheless, it is affected by some conceptual gaps, such as the so-called ‘measurement problem’.

The measurement problem is a problem insofar that we do not observe anything like objects being in superposition or quantum entangled in our everyday macroscopic realm. We do not perceive a world where things find themselves in a ‘surreal’ state of being, first in a ‘wavy’ superposition state or where objects are entangled and, once measured (that is, observed), collapse (that is, differentiate) into a concrete and definite ‘real’ world. From this weird fact was born the famous Schrödinger cat paradox. The question is why and where from comes such a huge ontological disparity between the microscopic quantum and macroscopic classical reality. After all, the latter is a bottom-up construct of the former. Nevertheless, in the macroscopic world of our everyday experience, we don’t see things in two places at once, or cats in a dead and alive superposition state. Is there a scale of transition between the microscopic quantum reality and the macroscopic world? If so, where and how does it come into being? The problem is that nothing in QP posits such a demarcation.

Moreover, QM is an information-theoretic contextual theory. This means that how a particle or system responds to a specific measurement depends on how the experiment is set up. It depends on the relation between the measured particle and the detector making the measurement, and how the information about it is extracted. For example, the particle behaves like a wave when it traverses a double-slit if we do not try to determine which slit it goes through, but it behaves like a particle if we try to find out through which slit it went. In other words, one could say that the outcome of a measurement depends not only on the initial state and boundary conditions of the particle but also on the experimental context with which it is measured—something completely at odds with our everyday experience of the macroscopic world where things are not contextual.

This weird state of affairs has led to a mainstream interpretation that is supposed to solve the measurement problem conjecturing that the true efficient cause of the quantum collapse is the human mind or the human conscious experience of the measurement. It solves the measurement problem positing the observer as having a role in quantum physical processes whereby the quantum collapse is elicited by the consciousness of the observer.

Notice, however, that in QM, what one means by an ‘observer’ could also be a mechanical measurement apparatus, for example, a photodiode or a CCD camera that detects the photons emerging from the double slit, and to which we would hardly associate any conscious experience. If one advocates for the interpretation that identifies the human conscious experience as having a causal power on the wavefunction collapse, then one is forced to also admit that even macroscopic measurement devices registering quantum phenomena must be in a macroscopic superposition until we, as humans, look upon it. This would imply that in Schrödinger’s cat experiment, the cat would, indeed, be in a superposition of a dead and alive state of existence until we open the box and control how it is doing. Or, by extension, all the world does not exist, or at least is not in a definite state of existence, until we, or some conscious subject, observe it. One could go so far as to say that the whole history of the cosmos from the Big Bang until nowadays collapsed into a definite state not before we looked at it.

Very few physicists feel comfortable with this anthropocentric interpretation which sees such a straightforward connection between QP and our human conscious experience. Most find this conjecture much too weird and implausible and reject altogether the idea that QP may have anything to do with consciousness or a mental phenomenality. The fact that quantum phenomena exist since the time of the Big Bang, much earlier than the existence of any physical conscious observer, does not support such an extreme viewpoint.

However, a third position is possible: One that is not anthropocentric but doesn’t embrace material monism either. The measurement problem, the indeterministic aspect inherent in quantum matter and the holistic aspect of entanglement make much more sense if we shift our perspective from the action of an individual human consciousness to a universal one.

From the perspective of Aurobindo, we might find the underlying wrong assumption. No conscious individual being is necessary to cause a wavefunction collapse; it is through the action of a cosmic Mind that the world appears as a differentiated unity. It is not our human individual mentality but, rather, a

cosmic consciousness that causes the wavefunction collapse and, for example, makes the particle hit one or the other interference fringe in the double-slit experiment.

This would be in line with the so-called ‘von Neumann chain’. According to John von Neumann, the father of the mathematical foundations of quantum mechanics, when a quantum system is in superposition, a measurement performed on it by a device would project the device itself into the superposition state. Therefore, one would need another, larger measuring device to collapse the wavefunction, which, however, would go into superposition as well, and so on. That is where the traditional speculation makes consciousness come in: Only a conscious mind collapses the wavefunction and cuts the chain leading it to a halting point. The difference between the metaphysical ontology presented here and that of the orthodox interpretation is that, here, no conscious mind of an organism is necessary to truncate the chain—it is all done by the universal Mind, not a human mind.

e. Matter and Forces in QFT

In line with what modern quantum field theory tells us, namely, that there are no particles as our naïve realism would like to imagine, but, rather, only vibrating quantum fields that interact with each other, Aurobindo commented:

“All is essentially response to vibratory contacts between force and force.” (Aurobindo, 1914-19, pp. 88, bk. 1, ch. X) – *“However the phenomenon of consciousness may be explained, whether Nature be an inert impulse or a conscious principle, it is certainly Force; the principle of things is a formative movement of energies, all forms are born of meeting and mutual adaptation between unshaped forces, all sensation and action is a response of something in a form of Force to the contacts of other forms of Force. This is the world as we experience it and from this experience we must always start.”* (Aurobindo, 1914-19) (bk. I, ch. X)

“We shall understand better if we go back at once to the original principle of things. Existence is in its activity a Conscious-Force which presents the workings of its force to its consciousness as forms of its own being. Since Force is only the action of one sole-existing Conscious-Being, its results can be nothing else but forms of that Conscious-Being; Substance or Matter, then, is only a form of Spirit. The appearance which this form of Spirit assumes to our senses is due to that dividing action of Mind from which we have been able to deduce consistently the whole phenomenon of the universe”. (Aurobindo, 1914-19) (bk. 1, ch. XXIV). – *“[...] for we know that Matter and material Force are only a last result of a pure Substance and pure Force in which consciousness is luminously self-aware and self-possessing and not as in Matter lost to itself in an inconscient sleep and an inert motion.”* (Aurobindo, 1914-19, pp. 269, bk. 1, ch. XXVI)

At bottom, we must posit consciousness as the origin of things. The nature of physical Force is the taking shape and form of an action of a Consciousness expressing itself in space and time.

Also, physics recognizes that matter is only the appearance arising from the dynamical action of a force onto another force as ‘a formative movement of energies’. Physics also knows that what we call ‘matter’ is itself the manifestation of ‘contact-forces’—that is, there is no solid object in the sense that we intend it in our macroscopic everyday experiences. Also, when we touch a solid object, what we perceive is the exchange of forces (microscopically, these are electric repulsive forces between atoms and molecules). *“Matter is the presentation of force which is most easily intelligible to our intelligence, moulded as it is by contacts in Matter to which a mind involved in material brain gives the response. The elementary state of material Force is, in the view of the old Indian physicists, a condition of pure material extension in Space of which the peculiar property is vibration typified to us by the phenomenon of sound. But vibration in this state of ether is not sufficient to create forms. There must first be some obstruction in the flow of the Force ocean, some contraction and expansion, some interplay of vibrations, some impinging of force upon force so as to create a beginning of fixed relations and mutual effects. Material Force modifying its first ethereal status assumes a second, called in the old language the aerial, of which the special property is contact between force and force, contact that is the basis of all material relations. Still we have not as yet real forms but only varying forces. A sustaining principle is needed. This is provided by a third self-modification of the primitive Force of which the principle of light, electricity, fire and heat is for us the characteristic manifestation. Even then, we can have forms of force preserving their own character and peculiar action, but not stable forms of Matter. A fourth state characterised by diffusion and a first medium of permanent attractions and repulsions, termed*

picturesquely water or the liquid state, and a fifth of cohesion, termed earth or the solid state, complete the necessary elements." (Aurobindo, 1914-19, pp. 87, bk. 1, ch. X)

Note how Sri Aurobindo points out that we must not take these categories—water, earth, wind, and fire—literally, but only as ‘picturesque’ metaphors which, however, are supposed to intuitively suggest something about the qualities of these forces at different levels of existence. The ‘ethereal’ and ‘aerial status’ are figurative ways to express the different phases of the subtleness of a phenomenon that only in its most gross appearance we perceive as material. It should be therefore clear from the context that the ‘ether’ Aurobindo is referring to here is something more subtle or ‘trans-physical’ than the ‘luminiferous ether’ that physicists once searched for, and showed to be non-existent. Nevertheless, the ‘vibrating ether’ he might be referring to here is in line with the modern notion of ‘quantum field’. It is reminiscent of QFT, where everything is all about vibrating force fields acting in a space-time coordinate system, and which give rise to the materiality of things by their mutual contact, in the form of attraction or repulsion. To every point in space, at any given time, one associates a vibrating field representing a particle, that is, a harmonic oscillator. In QFT, this is described by a probability field that tells us how much probability there is that, in a given location in space and at a given time, a particle will be found or, more precisely, an interaction between a force field with another force field will occur. In QP atoms are not hard objects but, rather, must be more appropriately described by probability clouds. Sri Aurobindo’s representation is very in line with modern physics in the sense that matter is no longer seen as made of single chunks that we like to identify as particles; instead, it describes it all as vibrating fields localized in space and time. What ultimately ‘oscillates’ is a field with some spatio-temporal extension, which becomes the origin of a formative movement that defines the fixed relations only when it interacts with another harmonic oscillator.⁷

But physicists do not know what these quantum fields are, other than an abstract mathematical functional associated with some particle and defined in space and time. This tells us nothing about the nature of the force itself. Whereas, from the perspective of Aurobindo’s spiritual cosmology, the four ‘fundamental’ forces are still not fundamental at all; rather, they are the last modification of a Force of Conscious-Being crystallizing out of more subtle (‘aethereal’ and ‘aerial’) status. Or, to put it in other words, while there is an overlap between physical sciences and Aurobindo’s ‘spiritual materialism’, the latter contends that even more ‘ethereal’ or subtle forms and substances exist, and of which modern physics still captures only a surface appearance.⁸

f. What is an ‘observation’? The quantum Zeno effect

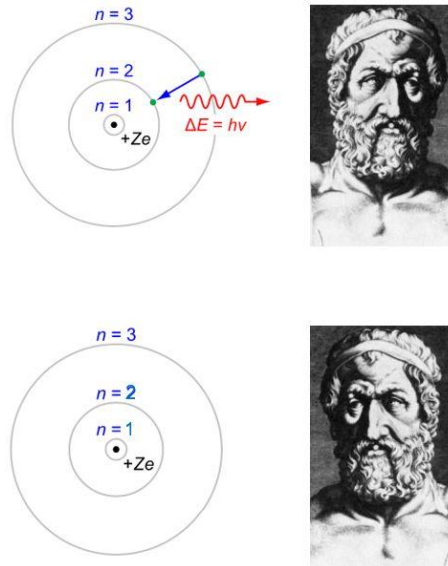
It may be useful to quickly mention another quantum effect: The ‘quantum Zeno effect’. It did not attract the same amount of attention as other weird quantum effects, but it is worth mentioning because it acquires a significance in the frame of an integral cosmology. The quantum Zeno effect is a phenomenon in which repeated and fast measurements slow down a quantum system’s time evolution. It is a peculiar quantum phenomenon and applies to every system and situation in which any kind of transition occurs in time. The Zeno effect describes the dynamics in the quantum regime whereby the transition probability from one quantum state to another is modified because of the measurement—that is, simply because it is ‘observed’. For example, take an unstable atom that has some probability of decaying next in time. The radioactive ‘*half-life time*’ of a specific type of atom is the average time after which 50% of a large number of atoms of the same type has decayed. This half-life time for each atom is not something we can engineer. It is a constant given by the laws of Nature. However, if measured continuously, the same atom will never decay. This implies that the probability that an atom will undergo an energy transition emitting a photon is lowered if the system is subjected to frequent ideal measurements.

For example, consider an atom that is excited by a photon and that undergoes an energy transition to a higher excited state. It will, sooner or later, relax to the ground state and emit a photon. The probability

⁷ For the theoretical physicist: the interaction term in a Lagrangian is precisely that. Interactions are represented as products of different quantum fields.

⁸ If this might have something to do with what nowadays in cosmology is known as ‘dark matter’ and ‘dark energy’, or if there could be eventually also another fifth force besides the known four fundamental forces, remains to be seen.

that this occurs within a specific time interval is entirely dictated by quantum laws. However, if the atom is subjected to fast and repeated measurements, the probability that this transition occurs will become lower and lower as the frequency of these measurements increases. Ideally, if the measurements are so fast that we can consider the observation as continuous, the transition probability tends to zero, and we can consider the system almost frozen in its initial quantum state. In other words, measurements can suppress the time evolution of a quantum system.⁹ To put it in other words again, it causes the wavefunction to collapse to the same quantum state from which the system wanted to evolve away.



*Fig. 5 The Zeno effect:
Observing an atom constantly will avoid its radiating energy.*

Notice again how, by ‘measurement’ or ‘observation’, one must intend every sort of interaction that causes the projection of the system onto the an allowed quantum state, not a human observation (even though, for the sake of simplicity, this is what Fig. 5 might suggest with Zeno’s severe look, but let us not take things too seriously!).

The quantum Zeno effect is not just a speculation or a theoretical conjecture but has been experimentally shown to exist (Itano & al., 1990). So, at least in QM, there is much truth in the good old saying that “a watched pot never boils”!

The analogy in the present metaphysical context is suggestive. Here, instead, it is the cosmic Mind that ‘observes’ by multiple exclusive concentrations something in itself and ‘freezes’ it into multiple material particles. One replaces the measurement device that ‘observes’ a physical system with the ultimate ‘Observer’ continuously observing Itself and, thereby, concretizing Itself in an atomic existence of material particles, some of which never decay.

If this should be considered only a coincidental analogy or it has a deeper meaning remains to be seen. But there is no contradiction or competition with the modern scientific view of things.

g. The Information-Theoretic Universe

Modern physics is questioning more deeply the fundamental reality of force, energy and space and time. For example, some physicists believe that the universe is information-theoretic. That is, everything can be described by information. If we try to investigate with mind what appears to our sense-mind, we see how, ultimately, everything dissolves into something immaterial that cannot be defined further than mere information. Or, as John Archibald Wheeler used to say, everything emerges from bits of information and we are ourselves somehow a complex aggregate of these information bits, observing

⁹ In technical parlance: each measurement projects the state vector back to the eigenstate.

the very same universe made again of bits. Pictorially, he tried to simplify this idea by drawing an eye observing its own self-extension. This was illustrated by Wheeler with his famous “it from bit” statement: “*It from bit symbolizes the idea that every item of the physical world has at bottom — at a very deep bottom, in most instances — an immaterial source and explanation; that which we call reality arises in the last analysis from the posing of yes-no questions and the registering of equipment-evoked responses; in short, that all things physical are information-theoretic in origin and that this is a participatory universe.*” (Wheeler, 1990)

It looks like physics suspects that the “It” in disguise manifests as the ‘bit’. In this view, the very stuff of the universe is information.

But what is information? Again, science defines information rigorously but cannot tell us anything about what information fundamentally is. In information theory, it is defined by Shannon’s entropy, which is essentially a logarithmic measure of the number of internal states a device can attain, or what we colloquially count as the number of bits that a chip memory can contain. In statistical physics, the notion of information can be linked to the Boltzmann-Gibbs entropy. It can be summarized as a logarithmic measure of the number of microstates a system can attain without changing its macrostate. For example, it tells us how many microscopic energy states each molecule or atom of a gas can attain without changing its macroscopic parameters, such as its pressure, temperature, or volume. Intuitively speaking, it is a measure of the potential variety of states a system can acquire without looking differently.

These information-theoretic and physical notions of information are tightly connected to the ability to differentiate, separate, or distinguish between two closely related physical states (say, how precisely we can determine between the ‘one’ and ‘zero’ states of an electronic state or between two positions of a particle). Our ability to distinguish between two states determines the number of states of the whole system we can count.

In this regard, as a side note for the more technically inclined reader, let us also point out the curious fact that a Lagrangian density—that is, the abstract mathematical functional that physicists use to calculate the dynamic evolution of particles and systems—can be reinterpreted as a local measure of information, called ‘Fisher information’, which represents the ability to distinguish between two nearby probability density functions (Soffer, 1995). From this alone, by applying the ordinary variational principles, one can derive all the laws of physics. This confirms that physics arises precisely because of an extremization of the power to distinguish, divide and separate in a process of interactions between observer and observed. It is an almost direct mathematical proof that all physics boils down to ‘multiple exclusive concentrations’.

Thus, information must not be confused with a measure of semantic content. This tells us nothing about how much meaning a book contains (whatever that might mean). Moreover, it is fashionable to posit information as the most fundamental property of the universe. But this fails to acknowledge that in physics, information always needs some sort of carrier—that is, something that contains it—such as a device, a microchip, a gas, a wave, or whatever physical entity in which it is encoded. It makes no sense to posit something as fundamental if that very same thing needs something else for its existence. What the physicist’s mind captures as an information-theoretic universe is only a mass of differentiable perceptions, distinguishable events, separable phenomena, and which amount is quantified with a number.

But, according to Aurobindo, this is only a superficial appearance of something undefinable and ineffable that goes beyond these differentiated and separable appearances. “*The cosmic Force, masked as a material Energy, hides from our view by its insistent materiality of process the occult fact that the working of the Inconscient is really the expression of a vast universal Life, a veiled universal Mind, a hooded Gnosis, and without these origins of itself it could have no power of action, no organizing coherence.*” (Aurobindo, 1914-19, pp. 1074, bk. 2, ch. XXVIII)

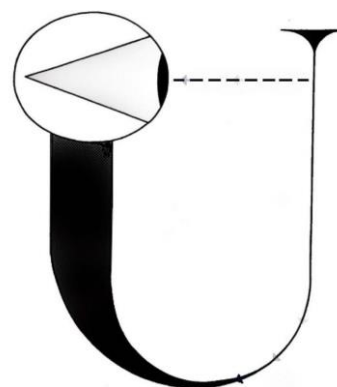


Fig. 6 Wheeler’s ‘It from Bit’.

h. Is It All About Relations?

Among the many interpretations of QM, the so-called ‘relational quantum mechanics’ introduced by Italian physicist Carlo Rovelli perhaps comes closest to intuiting some aspects of the spiritual cosmology of Aurobindo. Indeed, it realizes that to create forms, one needs what Aurobindo describes as “*impinging of force upon force so as to create a beginning of fixed relations*” (Aurobindo, 1914-19, pp. 88, bk. I, ch. X). In this interpretation, there is no meaning in saying that a certain quantum variable has taken a specific value. Rather, there is only meaning in saying that the variable has taken a value with respect to another reference variable. In the words of Rovelli (Rovelli, 1996): “*Quantum mechanics is a theory about the physical description of physical systems relative to other systems, and this is a complete description of the world.*”

These statements inevitably bring us back to the problem that modern theoretical physics faces. After so many attempts to find a quantum gravity theory (such as superstrings and canonical quantum gravity, to mention just a few), it is becoming clear that events in space and time are not only relative concepts, as described in Einstein’s theory of relativity, but also meaningless if considered on their own. We are frequently unaware of how all values of the dynamical variable that we ascribe to objects are based on a relation of sense-mind concepts. The simplest example is that of the measurement of a length. We cannot determine the length of an object if not in relation to the length of another object, or to a spatial interval defined by a phenomenon, and which we may eventually use as a standard sample. For example, one meter is defined as the $1/299792458$ part of the distance that light travels in a vacuum in one second. But thereby, we take a standard temporal measure as a reference that requires the definition of time. Indeed, the same applies to time when one second is defined in relation to particular atomic transitions. We cannot even say if a series of events (say, a series of atomic transitions) is equally distanced in time if we do not have a clock, that is, a physical system that we believe to be perfectly regular, against which we can compare it. But how do we know if the time ticks of this reference clock are temporally spaced equally? To do that, we need yet another system against which to compare it, and so on.

We end up finding that every measurement we make in physics has a meaning only if we create a relational dependence between the object measured and some reference measure or process. To speak at all about anything, we always need a relation between something and something else.

Moreover, QM can also be seen as a calculation of correlations—meaning that a relationship comes into co-existence by a direct or inverse mutuality between parts (typical example: Once two particles are measured, their spin is correlated or anti-correlated—that is, with the same or opposite spin, respectively). What QM really does is ascribe relations and correlation based on reference objects in the background (most of the time, without us being aware of this) and only then builds a bottom-up description of reality departing from individualized entities and physical magnitudes by construction from elementary particle to a whole.

The problem that relational quantum mechanics encounters, however, is that it posits relations as fundamental to the physical world. From Aurobindo’s perspective, while this insight, indeed, captures an essential truth, relations as such cannot be fundamental for the same reason that information cannot be fundamental. As information can’t be fundamental because it always needs a carrier that contains it first, likewise also relations can’t be the last word since there must always be something to relate to. Relations abstracted from relata have no meaning in themselves. Thus, on the one hand, we realize that relata like time, space, material objects, forces, forms, and shapes make sense only if we describe them against a background of relations, on the other hand, this background itself must contain these relata in the first place and is determined by it.

In Aurobindo’s cosmology, this ambiguity does not appear because it starts from something underlying that is relation-less and non-physical, and yet relates its own cosmic self-determinations. That is, this background can be nothing else than a Being, undifferentiated and a timeless non-physical holistic Whole. Ultimately, the fact that the universe is made of different objects, bodies, or particles is nothing else than Brahman entering in spatial, temporal, numerical, dynamical and qualitative relations with itself.

Moreover, the difficulty also arises because of an even stronger sociological drive towards reductionism, which misinterprets the understanding of the world from the perspective of the ordinary fragmenting mind as the ultimate tool for knowledge. What our sense-mind realizes is a mutable relation of forms and interactions of forces, but it cannot view all things in a multiple unity, as the seer can apprehend once risen to the heights of the supramental consciousness:

“In a certain sense Matter is unreal and non-existent; that is to say, our present knowledge, idea and experience of Matter is not its truth, but merely a phenomenon of particular relation between our senses and the all-existence in which we move.” (Aurobindo, 1914-19, pp. 248, bk. 1, ch. XXIV)

The universe appears to us as an indeterminate boundless Infinite, which, nevertheless, manifests as a play of determinations in the form of matter, energy, structure, etc. On the one hand, we have the undifferentiated, immutable and featureless cosmic existence, and on the other hand the very same entity self-representing itself in itself by a variety of general and particular determinates in the form of mutable material processes. What emerges to our sense-mind as the laws of QP is nothing other than a universal undifferentiated Being that self-manifests by plunging itself into spatial and temporal relations. The Source is a featureless indeterminate Oneness that is beyond space and time, but objectifies itself in space and time by a variety of relata and relations. One might say that the Infinite—that is, the Indeterminate—does not create anything; rather, it manifests relations between its own self-determinations.

Of course, this is a senseless play of words for the dividing mind that, by its innate principle of division, is inherently unable to reconcile these opposites. Yet, not so for the seer who apprehends the world from the overmental or supramental consciousness. In overmind, one reaches a pure silent self without feature or qualities or relations and yet is a determinative knowledge-power.

“This opposition which is yet a collocation, as if these two were correlatives or complementaries, although apparent contradictions of each other, sublimates itself into the coexistence of an impersonal Brahman without qualities, a fundamental divine Reality free from all relations or determinates, and a Brahman with infinite qualities, a fundamental divine Reality who is the source and container and master of all relations and determinations—Nirguna, Saguna. If we pursue the Nirguna into a farthest possible self-experience, we arrive at a supreme Absolute void of all relations and determinations, the ineffable first and last word of existence. If we enter through the Saguna into some ultimate possible of experience, we arrive at a divine Absolute, a personal supreme and omnipresent Godhead, transcendent as well as universal, an infinite Master of all relations and determinations who can uphold in his being a million universes and pervade each with a single ray of his self-light and a single degree of his ineffable existence. The Overmind consciousness maintains equally these two truths of the Eternal which face the mind as mutually exclusive alternatives; it admits both as supreme aspects of one Reality: somewhere, then, behind them there must be a still greater Transcendence which originates them or upholds them both in its supreme Eternity.” – “[...] for Brahman is free from all possibility of relations and determinations, but Maya is a creative Imagination imposing these very things upon It, an originator of relations and determinations of which Brahman must necessarily be the supporter and witness—to the logical reason an inadmissible formula.” (Aurobindo, 1914-19, pp. 325, bk. 2, ch. I)

“All-Existent figuring Himself out in an infinite series of rhythms in His own conceptive extension of Himself as Time and Space. Moreover we see that this cosmic action or any cosmic action is impossible without the play of an infinite Force of Existence which produces and regulates all these forms and movements; and that Force equally presupposes or is the action of an infinite Consciousness, because it is in its nature a cosmic Will determining all relations and apprehending them by its own mode of awareness, and it could not so determine and apprehend them if there were no comprehensive Consciousness behind that mode of cosmic awareness to originate as well as to hold, fix and reflect through it the relations of Being in the developing formation or becoming of itself which we call a universe.” (Aurobindo, 1914-19, pp. 280, bk. I, ch. XXVII)

There is always a pure unconditioned timeless Infinite that may condition itself in a temporal context, but this is also only mental division.

“We make the distinction of conditioned and unconditioned and we imagine that the unconditioned became conditioned, the Infinite became finite at some date in Time, and may cease to be finite at some other date in Time, because it so appears to us in details, particulars or with regard to this or that system

of things. But if we look at existence as a whole, we see that infinite and finite coexist and exist in and by each other. Even if our universe were to disappear and reappear rhythmically in Time, as was the old belief, that too would be only a large detail and would not show that at a particular time all condition ceases in the whole range of infinite existence and all Being becomes the unconditioned, at another it again takes on the reality or the appearance of conditions. The first source and the primary relations lie beyond our mental divisions of Time, in the divine timelessness or else in the indivisible or eternal Time of which our divisions and successions are only figures in a mental experience.” (Aurobindo, 1914-19, pp. 400, bk. II, ch. III)

i. Space-Time from Beyond Space and Time

Physics always took it for granted that space and time—or, more generally, space-time as described in general relativity—is fundamental and, for our ordinary human understanding, something which presents itself as a self-evident given and an obvious reality which only philosophers felt was worth further investigation. In mathematical physics, space and time can be described with a coordinate system as an extended manifold, which eventually can be curved by a mass and formalized as a non-Euclidian surface of coordinated patches. In fact, in the theory of general relativity, space and time are represented as a unique space-time manifold. In general relativity, as in QM, time is just a parameter and represents the flow of a space-time slice through and along a larger four-dimensional space-time ‘block’ (three spatial dimensions and one temporal dimension) where past, present, and future are represented as a unique and eternally present ‘block universe’. This is a philosophical perspective called ‘eternalism’, sometimes also referred to as ‘block time’. In physics, especially Einstein’s relativity, it is quite conventional to consider time as an added dimension to the three spatial extensions. If, however, time could be considered yet another geometrical dimension which nature and essence can be placed on an equal footing with the geometrical spatial ones is a matter that remains ontologically questionable.

Yet, there is a growing awareness that our underlying assumption about space and time must be reconsidered. Nowadays, physicists still do not know what the deep and fundamental message is that Nature is trying to convey, but after the failure of previous theories of quantum gravity, the question about the nature of space and time gained new impetus. The lack of progress in building a theory of quantum gravity has led physicists to question if space and time might not be themselves emergent properties. But nobody knows for sure where or what to look for and in what direction physics should proceed. Physics is itself an intellectual construct standing upon the pillars of the notion of space and time. If we take away these fundamental concepts, one must wonder: What is physics about?

It is here where the vaster and more comprehensive vision of the universal process described by Aurobindo from the state of consciousness of a supramental vision can become of interest and reconcile apparent opposites, such as a ‘divine timelessness’ becoming temporal. Also, according to the Vedantic tradition, once we rise to higher states of consciousness, we recognize how the source of space and time is immovable and immutable—that is, an ever-changeless and yet ever-changing Absolute creating the illusion of motion and mutability. The Infinite in time is the same timeless Infinite. It is something which to the human mind is only wordplay, a contradiction in itself, because our sensory perception is based on a fragmenting and dividing sense-mind that linearly divides space and time.

“All being, consciousness, knowledge moves, secretly for our present surface awareness, openly when we rise beyond it to the spiritual and supramental ranges, between two states and powers of existence, that of the timeless Infinite and that of the Infinite deploying in itself and organizing all things in time. These two states are opposed to and incompatible with each other only for our mental logic with its constant embarrassed stumbling around a false conception of contradictions and a confronting of eternal opposites. In reality, as we find when we see things with a knowledge founded on the supramental identity and vision and think with the great, profound and flexible logic proper to that knowledge, the two are only coexistent and concurrent status and movement of the same truth of the Infinite.” (Aurobindo, 1914-1921, pp. 885, pt. IV, ch. XXV)

It is a curious historical fact that already in the 1960s a fundamental mathematical discovery, made by John Archibald Wheeler and Bryce De Witt, puzzled physicists. We know that the time-dependent

Schrödinger equation¹⁰ is the foundation for the description of the (classical) quantum world. When applied to atoms, molecules, or larger aggregates of particles, it successfully describes matter. If, however, one applies the same rules of general relativity to QM to the whole universe, it can be shown that the very same equation loses its temporal component, that is, the universe as a whole appears to be timeless. This seemed at first to make no sense. We all know very well through our direct everyday experience that in our universe, things change in time. The quantum system we call the ‘universe’ does not at all look timeless; it appears to us as being subject to time and change in time. The Wheeler-deWitt equation seems to suggest that the universe dynamically changes in time as we perceive it with our mental consciousness—ultimately, something that deep down has a property of static immobility, contradicting any mental conception and sense-mind experience.

In hindsight, however, this might not be so surprising. If we recall from the previous section how everything is relational—that is, it makes no sense to speak of a physical quantity if not in relation to something else—the timelessness of the Wheeler-deWitt equation emerges because there is no time to relate in the first place. Once one looks at the universe outside of it (that is, also outside of time and space itself), one loses the reference spatial and temporal relations and the Universe appears as timeless or, more precisely, where time makes no sense and no longer needs to appear as a parameter in the theory. Time in QP makes sense only if we accept that time emerges from something timeless.

It is also worth pointing out that in physics (even in classical physics) time appears without any directionality. Physicists write the differential equations of the time evolution of a physical system from the present to the future—that is, imposing initial conditions and calculating a solution forward in time—only because it fits better our everyday experience. But there is no law of physics or logical principle that disallows from writing the same differential equations from the future to the present—that is imposing final conditions and calculating a solution backward in time. Why does our conceptual formalization of the real world in mathematical terms represent a temporally directionless reality which is so contrary to our human perception? This is the famous problem of the ‘arrow of time’ in physics and that still didn’t find a satisfying resolution to date.

In this regard, an interesting interpretation of QM is the so-called ‘time-symmetric’ or ‘two-vector interpretation’. This is an interpretation based on the idea that the laws of QP apply equally well if we consider not only the initial conditions of a quantum system but also its state in the future altogether. That is, instead of considering a single wavefunction describing the quantum system’s evolution from an initial to a final time, that is, from the present to a future state, it introduces time-symmetry by adding a second wavefunction or state vector which evolves the system from the future to the present. The known physical laws do not forbid the time parameter from going back, like in a film playback. The time-symmetric interpretation of QM says even more than that. It tells us that we can regard the ‘now’ as something which has been evolved from the future to the present.

A similar but distinct approach from the time-symmetric interpretation is the ‘transactional interpretation’ of QM. Here, one deals with time in a peculiar and non-conventional manner as well. In its basic classical version, the transactional interpretation conceives of a modified interaction theory between particles. The interaction between one emitting particle and another absorbing particle is no longer seen as the emission of a single field propagating forward from the emitter to the absorber. Rather, the emission/absorption process is represented as an exchange of two fields emanating from both particles at the same time and that meet halfway with a ‘quantum handshaking’ reciprocal action. Both particles act with a temporal shift – the emitter with a half-retarded forward propagating field emission, the ‘offer wave’, and the absorber with a half-advanced backward propagating field response by means of a ‘confirmation wave’. It is called a ‘transaction’ because it is analogous to a financial and supply transaction. Moreover, in this picture, the collapse of the wavefunction is caused by the response of the absorber as an irreversible process. The absorber’s future anticipating response is, in itself, viewed as the measurement.

In both the time-symmetric and the transactional interpretations the future (past) seems to know already something of the past (future). While past, present, and future appear as distinct to our ordinary consciousness, in physics both seem to be inextricably intertwined in some mysterious way we still

¹⁰ The time-dependent Schrödinger equation is one of the most fundamental differential equations of QM describing the dynamical evolution in time of the wavefunction of a quantum system once the boundary conditions and the initial conditions of the system are given.

struggle to make full sense of. These interpretations might be only mathematical abstraction to which we should not strictly ascribe an ontology, but they are logically coherent with the (classical, quantum, or relativistic) laws of physics we know and, when we look back at Aurobindo's description of what time appears from the supramental state of consciousness, they are somehow reminiscent of what he called the 'threefold supramental Time-Vision'.

"Our mental view of these two categories [space and time] is determined by the idea of measure which is inherent in the action of the analytical, dividing movement of Mind. Time is for the Mind a mobile extension measured out by the succession of the past, present and future in which Mind places itself at a certain standpoint whence it looks before and after. Space is a stable extension measured out by divisibility of substance; at a certain point in that divisible extension Mind places itself and regards the disposition of substance around it." – "And to a consciousness higher than Mind which should regard our past, present and future in one view, containing and not contained in them, not situated at a particular moment of Time for its point of prospection, Time might well offer itself as an eternal present. And to the same consciousness not situated at any particular point of Space, but containing all points and regions in itself, Space also might well offer itself as a subjective and indivisible extension,—no less subjective than Time." (Aurobindo, 1914-19, pp. 143, bk. I, ch. XV)

Physics is slowly but steadily discovering that the Cosmos as we experience it is an illusion, and yet the projection of a very concrete Reality.

4. Conclusion

Aurobindo was a mystic, a yogi, and a poet. He wasn't a scientist and didn't consider himself even not a philosopher. Moreover, the main corpus of his works was written in the 1920s and many discoveries about the material world had still to come. Nevertheless, his ontology and his message remain actual. If we start from this wholistic cosmological perspective we might start seeing the world making more sense than viewing it from the materialist, reductionist, physicalist standpoint. While philosophy and metaphysics cannot replace science nor be taken as proof of any conjecture, speculation, or theoretical framework of physical reality, taking into account the reports of those who have ascended to higher levels of consciousness, however subjective and personal these might be, could give us at least some intuitive hint, suggestion or inspiration that could help science to unveil our human fallacies and look beyond still too classical and superficial models of reality. Sri Aurobindo used to say that: "*Science cannot dictate its conclusions to metaphysics any more than metaphysics can impose its conclusions on Science*" but that "[...] *physical Science is necessarily incomplete in the range of its inquiry and has no clue to the occult movements of the Force.*" (Aurobindo, 1914-19, pp. 190, bk. I, ch. XIX) We hope this essay might have helped some philosophers and scientists to broaden their range of inquiry.

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