Science and Scientific Conscience

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Science studies the phenomena of nature and the mathematical laws that govern them, seeking to align physical reality with the mental image we have of it. The world as perceived by the senses can be explained mathematically in our everyday reality, but not in the realm of tiny quantum particles, which are on the order of nanometers. It becomes necessary, therefore, to rethink our worldview and the representation we make of it. This leads us to consider counterintuitive realities and to rethink the relationship between the universe of physical reality, the abstract reality of mathematics, and the physical and mental processes that allow us to observe, understand, and become aware.

The physical universe

By the physical universe, we mean the concrete and tangible universe where various forms of energy, such as thermal, chemical, and electromagnetic, as well as matter itself, interact and intertwine. It is a universe of observable, measurable, and experimental evidence.

The abstract universe

The question of whether mathematics is invented or discovered is a fascinating philosophical debate. Some argue that mathematics is a construct of the human mind, developed to understand and model the world around us. From this perspective, mathematics is practical and useful tools but has no independent existence outside the human mind. Others believe that mathematics exists as an independent reality, and humans discover rather than invent it. According to this view, mathematics is universal and timeless truth that exist independently of our perception or understanding.

Does this mean that mathematics has served as a blueprint intimately linked to the creation and organization of the observable universe? The fact that mathematics seems so precisely tied to the physical laws of the universe suggests that mathematics plays a profound role in the very structure of reality. For example, complex numbers, which may seem abstract or imaginary, find concrete and powerful application in quantum physics: they are incorporated into the Schrödinger equation, which accurately describes the behavior of quantum particles. Nature operates with complex numbers and is not limited to real numbers. Could this indicate that the multitude of existing mathematical theorems are indeed waiting to find their correspondence in the tangible world? In other words, mathematics would be a fundamental, precise, and coherent language for describing and understanding the fundamental laws of the universe, suggesting that they constitute a sort of mental reality that reflects and informs physical reality.

The mental universe

The mental universe refers to the human mind, which, among its many faculties, includes the ability to reason logically and interpret the physical world through mathematical relationships. Although Euclidean mathematics was initially inspired by observations of physical reality and sensory perception, the field has evolved in multiple directions, moving away from Euclidean mathematics and offering a valuable perspective for exploring and understanding the physical universe. This ability to discover mathematics is independent of any experience. It is based on the logos, which Philo of Alexandria (at the beginning of the first millennium) identified with God and considered the source of the emergence of an intelligible world. Three centuries ago, Galileo argued that the laws of nature are written in the language of mathematics. In the 20th century, Eugene Wigner spoke of the unreasonable effectiveness of mathematics in the natural sciences. Does the immaterial mental universe then correspond to a reality of its own?

Exploring the abstract and the concrete

The idoneist seeks the adequacy of the rational to the real and that of the intelligible and faithful representation to the sensible world. He aims to synthesize the abstract and the concrete. Mathematics that deals with physical principles seeks to establish coherence in thought, or at least a congruence between the abstract and the real. However, both formal thought and physical principles can be challenged when faced with contradictions. Does the scaffolding of abstract mathematics serve to construct our understanding of physical reality, or do conceptual models of this reality only retain abstract mathematical structures? It must be kept in mind that mathematics tends to unify and homogenize a heterogeneous reality that is difficult to reduce to monism. Indeed, mathematical models of physical phenomena are always only imperfect approximations. Rather than substituting one domain for another, the epistemologist must place himself at the intersection of physical reality and abstract mathematical representation to better understand their interaction. Scientific truth is built through continuous decipherment.

Algorithmic calculation and human intelligence

The truth derived from algorithmic calculation relies on pre-programmed laws and does not constitute an absolute truth. The awareness of truth does not rest on deterministic hypotheses: the cognitive meaning of human intelligence is a faculty that, in any case, cannot be pre-programmed. Reproducing the functioning of the human brain is a real challenge, especially since it encompasses dimensions of psychic and psychological interiority, integrates multiple reminiscences, and is not limited to simple physico-biological determinism. Extremely powerful artificial intelligence can solve complex problems that exceed human capabilities. However, simulating the functionalities of the human brain does not guarantee the emergence of human consciousness and its ontological perspective.

Metaphysical unity

The biblical concept that the universe was created by divine word has led some theologians and people of faith to think that the mental universe, influenced by spiritual forces, could affect the physical universe. This belief has paved the way for the acceptance of miracles and the idea that practices such as prayer can influence events in the physical world. Consequently, this has opened the door to metaphysical speculations suggesting that the supreme mental universe is God, who is not subject to the laws of nature and who created the cosmic machine with a particular intention. Moreover, the precision with which the origin of the universe we know was created—on the order of ten billion to the power of 123—leads to the consideration of a designer or coder.

However, with the advancement of science and an increasing understanding of the mechanisms of the universe, some people believe that God, traditionally invoked to explain the inexplicable, has been somewhat overshadowed. Science provides rational and verifiable explanations for many natural phenomena, challenging the role attributed to divinity in understanding the world. That said, science cannot explain everything. According to the scientistic school of thought, which aims to be factual, relies on experimental science, and opposes any form of religious revelation, science has not yet explained everything.

Nonetheless, science scarcely explains what might have existed before the Big Bang, which is said to have occurred 13.8 billion years ago, just as theology cannot explain what might have preceded God. This leads one to think, as Malebranche suggested, that truth without the quest for truth is an incomplete truth.

The metaphysical approach to physical, abstract, and mental dimensions is arguably the most unifying in understanding the universe and the role played by human beings, made in the image of the Creator. Attached to this are moral values that form the foundation of our Judeo-Christian societies.

Believers may identify their intellectual selves with spirituality, which transcends the laws of matter, echoing Aristotle's assertion that form and matter annihilate each other when separated, except for the human soul. The agnostic approach, however, is content with the explanation that human beings are the result of biological evolution and bases its moral values on common sense.

The Search for unity

Humanity aspires to find unity by exploring the fundamental nature of the universe. The first chapter of Genesis depicts an initial state of chaos followed by the emergence of a primordial light ("Let there be light!") that marks the beginning of cosmic creation. Many researchers have interpreted this biblical account as a confirmation of the Big Bang, considered the starting point of the universe's expansion. This is notably the case of the chanoine and astronomer Lemaître, who, having proposed this hypothesis, wrote to Einstein suggesting that the theory of relativity implied there was a day without a yesterday. Lemaître attempted to integrate the transcendental dimension—normally irreducible to science—into the scientific explanation of the universe's genesis.

The James Webb Space Telescope, launched in 2021, has revealed the premature existence of galaxies nearly 220 million years after the Big Bang. This highlights that our understanding of the physics of the universe's early moments is incomplete.

New horizons, new questions

The curious and scientific mind is besieged by fundamental questions: the commonly accepted laws of nature are human interpretations of what they truly are. In the past, people believed the Earth was flat until Aristotle demonstrated its roundness by observing the Earth's shadow during lunar eclipses. Similarly, it was thought that the universe revolved around the Earth, but Galileo and Copernicus showed that astronomical observations contradicted this idea. Our minds have been shaped by everyday reality and find satisfaction in the Newtonian interpretation of the world. However, reality and our perception of it are not identical, and our minds are not suited to grasp the quantum world, which is invisible and governed by different laws. Nevertheless, intelligence remains capable of revealing alternative truths and exploring novel hypotheses. This is precisely what Einstein achieved by unifying, through a theory, the validation of experimental results considered incongruous at the beginning of the 20th century.

Examining the reality of matter

Particles can simultaneously be waves. This is where the observer comes in: it is only in terms of the interaction between the object and the observer that the properties of any atomic object can be understood. Matter can exist or tend to exist according to certain probabilities, that is, the probabilities of finding particles at specific points in space and time. The intrinsic matter component must be discarded. There is no longer an objective quantitative description of intrinsic matter because the measurement result depends on the observation. In quantum physics, measuring a system means disturbing it. Nature must be envisioned as a complex network of relationships involving matter and the observer.

Thus, observing an electron influences the determination of its position! It behaves as a wave when unobserved and as a particle when observed. A light ray is both an electromagnetic wave traveling through space and a stream of moving particles. This impressive thesis, supported by Born (Nobel Prize in 1954), successfully predicts particle behavior based on Schrödinger's wave equation.

In quantum mechanics, everything is described by this wave function. The problem is that the particle seems to be in two (or more) places at once (superposition principle). Only during measurement can the particle's position be determined: the measurement (or observation) causes the collapse of Schrödinger's wave equation. Measuring ends the superposition state and transitions to a single defined measurement state; it also transitions from probabilistic quantum mechanics to deterministic Newtonian mechanics. What explanation can be offered?

For imaging purposes, if we extrapolate subatomic phenomena to sensory reality, we would exist in multiple places. It is only when we observe or measure that the position becomes determined, or more precisely, we increase the probability of existence at a particular position!

Scientific recognition of laws

In their endeavors, scientists recognize the existence of laws. Their experience is limited to the present, including the current memory of past observations. Predicting the future based on the present can only be done from a well-established principle of induction. Indeed, the distant correlation of quantum particles, known as the entanglement principle, is instantaneous and defies our intuitive understanding of reality. Could quantum entanglement be considered retrocausal communication, given that two entangled particles seem mysteriously connected even when separated by billions of kilometers? Or, could we consider that there is bidirectional causality? If so, could we argue that future events can impact current measurements?

And if conscious perception, not subject to physical laws, were the real cause? What if the observer's premonition, formed through contact with reality, were the cause? Could it be that at the moment of observation, information is sought from the past, and objective reality only takes shape when observed by a consciousness?

Deep philosophical questions

We find ourselves facing profound philosophical questions. Can we reconstruct the past or the future once it has been observed in the present? Could there be an infinity of possible pasts and futures in parallel worlds? Is it the observation in the present that instantaneously determines the existence of one of these parallel worlds? Could free will, intimately connected to morality, modify the future in such a way that it allows us to choose one of multiple futures from the observation of the present? And if there were as many futures as there are observers?

The correspondence between the senses and objects constitutes a faculty of knowledge. How can we qualify the relationship between the senses that command perception and the ideational conception that defines this perception? Neuroscience theses have been proposed suggesting that consciousness could emerge from the complex workings of billions of neurons and trillions of cerebral synapses, and that our senses play the same role as a computer keyboard, masking the complexity of the electronic circuits of its processor. The hypothesis of a consciousness based on a quantum connection has also been advanced, potentially allowing the emergence of artificial consciousness. But these hypotheses have not convinced the scientific community.

The quantum entanglement debate

Einstein doubted the existence of the entanglement phenomenon, believing that his analytical calculations had overlooked a crucial parameter. In 1935, he published an article with Rosen and Podolski to contest the paradoxical idea that two entangled particles possess an objective reality. In 1964, Irish researcher John Bell proposed an experiment to verify quantum entanglement, which was successfully conducted by Alain Aspect in the 1980s.

Exploring synergy between cognitive mechanisms and consciousness

A similar approach is necessary today concerning the synergy between quantum entanglement, observation, causality, and knowledge to better understand the cognitive mechanisms that lead to the mental image. It is also essential to determine the correlation made between the observation of an object or being, their mental image, and the reflective awareness of the act of observation. This would help demystify the interconnectedness of the physical universe, the abstract universe, and the mental universe.

To get to the heart of the matter, we must observe, measure, and experiment to validate a hypothesis that is verifiable. Concepts such as free will and consciousness can be considered after such an approach has left a definitive void in scientific reasoning.

Fundamental questions remain

Nonetheless, fundamental questions remain: how do nature, being, the consciousness of nature, and self-awareness articulate with one another? These are open questions that continue to challenge our understanding of reality.