Rational vs. Conscious Experience In Time And Space Matters

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Abstract

Rational experience is based on analysis; it deals with the elements of the universe (stars, planets, living beings, atoms and so on) in separated ways. Conscious experience instead reconnects the scientist (the observer) and the universe as a whole. It reaches beyond the duality subject-object. Conscious experience thus represents not only an enrichment for scientific research, but a vital part of productive science, especially when dealing with time and space matters.

Keywords: time, space, spacetime, mind, rational experience, conscious experience

Introduction

In the universe the passing of physical time cannot be clearly perceived as matter and space can be; one can perceive only irreversible physical, chemical, and biological changes in space. On the basis of elementary perception (sight) one can conclude that **physical time exists only as a stream of changes** that happens through space. The terms "physical time" and "stream of changes" describe the same phenomenon. It is not that changes happen in physical time, changes themselves are physical time. [**1**] The universe is composed of only two things: space and its content, with both these components **changing**.

Physical changes are also irreversible, and thus physical time. When we throw a pen across a table, we see that the pen could retrace its path back; so reversibility is implied by the mind in this mental construction of a process in time; time then appears naturally reversible, but changes are not. The perception of the movement of the pen enters the senses, goes into the rational part of the mind where it is elaborated through the concepts of linear time (a mental map of the changes), three-dimensional space, logic and mathematics, and becomes an experience:

movement of the pen -> perception (eyes)
-> elaboration through the time and space of the mind -> experience

Also, as discussed in [**1**], the speed of psychological time does not always follow physical time, i.e. psychological time is independent of physical time.

These features of the concept of time as they are versus as seen by the mind lead us to identify the importance of differentiating for science between what we will call rational experience and conscious experience.

The differences between rational and conscious experience

The scientist (the observer, the watcher) is a consistent part of a scientific experiment. He or she observes an experiment and measures it with instruments. Without an observer a scientific experiment cannot exist. When observing the experiment, the observer can also simultaneously observe the way his/her mind elaborates the experiment. He or she becomes aware of how this elaboration influences the experience of the experiment. With this awareness **rational experience** of the experiment is enriched with **conscious experience**. Having conscious experience one grasps exactly what one perceives. Conscious experience is direct, as the mind does not interfere between perception and experience:

conscious experience

universe -> perception (senses) -> conscious experience

On the other hand, rational experience is indirect. **Perception** and **experience** become separated through the rational activity of the mind. Information en-

ters the senses, goes into the rational part of the mind where it is elaborated through logic and mathematics, and then becomes an experience:

rational experience

universe ->perception (senses) ->elaboration (mind) ->rational experience

One experiences physical time **consciously** as he/she perceives it: as a stream of changes in space. Rational experience is enriched with conscious experience by simply allowing the observer to watch his or her mind. Watching is an **individual** research method, using the **imagination** of the researcher, as Einstein saw [**2**]. Rational experience is based on analysis, it deals with the elements of the universe (stars, planets, living beings, atoms and so on) in separated way. Conscious experience instead reconnects the scientist (the observer) and the universe as a whole. It reaches beyond the duality subject-object.

Conscious experience may assist rational experience

Through rational experience one grasps a stream of changes as linear time (through making a mental map of the changes), while conscious experience reveals this stream as an irreversible process. As we have seen, by observing this stream, humans have developed psychological time through which we rationally experience the universe. However, psychological time is reversible. One can go back into the past. This creates then an idea, i.e. a model that physical time physically exists (notably through its past), but this is not so.

In that line, General Relativity allows a speculation about time travel. Someone could travel through a black hole with a spaceship, go back into the past and kill his grandmother. The consequence is that he could never have been born.([**3**], Chap. 11) This effect is technically covered through the term of "Closed Timelike Curves" in General Relativity, as studied by Hawking, Thorne and others, without questioning GR itself in the first place. The hope is that the quantum somehow can fix this.[**4**] This shows the lack of causality built into General Relativity, a fact that was of great concern to Einstein as an unphysical feature of his theory. This feature was tied to the fundamental disconnection of space from its contents within the basis of the theory (the "hole" problem), and a problem he dealt with for 2 years before succeeding in making it at least mathematically acceptable for final publication. [**5**] This is still a key problem, showing the theory ultimately to be a crude model of reality, and only acceptable within the limited framework of rational experience.

Traveling into the past is not possible because a stream of changes is irreversible; the past exists only as **psychological time**, through which it is not possible to travel with a spaceship or otherwise (H.G. Wells' Time Machine?). The problem of the "Arrow of Time" has been known since the 19th century, as

classical mechanics has reversible equations when dealing with the time parameter, while the world is not reversible.[**6**] One could only conclude that classical mechanics was a model ultimately incomplete to represent reality. In the 20th century, quantum mechanics dealt with this through the "collapse of the wave-function," an irreversible but unexplained process, a pure axiom within the model of the theory. However, even there the Schroedinger Equation is reversible, so quantum processes are still seen as reversible. In the 1940s, Feynman and Wheeler seriously considered physical processes running backward in time, and such an approach was seen as perfectly acceptable in a rational experience.[**7**] In all these cases, conscious experience must then correct rational experience.

Time as a stream of changes in the theory of Relativity

We can measure the rate of changes with clocks, but according to Special Relativity, the value obtained from this measurement is *relative to the amount of accelerations experienced by the observer following a given path in-between measurements*. For twins going in separate paths, the total amount of changes between their separation and reunion (i.e. **measured at common events**) is found less for the twin who experienced the most/higher accelerations. In other words, if **relative velocities** are in average and magnitude close to the speed of light, the twin in the most accelerated spaceship is found at the end of his trip to be substantially younger than the twin in the other spaceship. The hypothesis that time was slower on the most accelerated travel is a **rational prediction** from Special Relativity ([**3**], Chap. 2). This can be confirmed by conscious experience **only** upon reading clocks at the event **where and when** the twins meet again (in the same frame of reference), as the limited speed of light otherwise spoils any attempt at comparing ages in-between the events. *Different accelerations* are destroying the symmetry of the relative velocities between the twins that at first sight would predict symmetric aging effects (thereby leading to the famous "twin paradox"). The clocks measure only the amount of changes, not time, at their location in space **in-between** the start and end of the trips. So rational experience here has to assist conscious experience: The comparative features of streams of changes between common events can only be reached through the **model** of physical time constructed through rational experience, not through conscious experience.

In a similar way, experiments with high precision clocks confirm that the rate of changes is less in the parts of space where the gravitational field is stronger, as the model of General Relativity predicts, a rational experience by definition. This means that with an increase of the "roundness" of space, the rate of changes is getting less. These changes in the characteristics of space from place to place, not accessible to conscious experience, beg the question: Is space then changing also with changes in its contents?

Changing space in the theory of Relativity

Space indeed has to change with changes in its contents, and this as a result of a **conscious** experience, Einstein's. This experience was reached by visualizing space as bent by the presence of matter. In that experience, he saw the oneness, timelessness, and harmony of the universe. Subsequently, he worked hard to express what he felt into a rational model. General Relativity was the result. This subsequent **rational** experience made him then see **how** space changed along with changes in matter. In order to keep matter and space in **dynamic equilibrium**, the conscious image of an **infinite** three-dimensional space had to be replaced with the rational image of a **finite** Riemannian surface in four dimensions, called "spacetime," with a succession of subspaces called "spacetime slices" that sustain the changes in the contents of space. This transition from conscious to rational experience required specific **assumptions** to be made a priori, including an even spread of matter in the universe and an only optional presence of electromagnetic fields; but such assumptions were taken before galaxies were discovered, that showed the enormous distances between "islands" of matter, and before quantum theory came up with the ever-present electromagnetic "zero point energy" of "empty space." [**8**]

The above rational experience of a dynamic equilibrium between space and its contents was expressed by the equation (a Poisson equation-type) Einstein worked out, using Grossmann's mathematics.

Through this model, time was then half integrated with space, with changes in space described through a succession of subspaces, and with the rate of changes in matter and electromagnetic phenomena measured **locally** with clocks. This half-integration to space resulted in time being still reversible in the equation he obtained, and such a feature was considered a failure by him (Chap. 3 of [**6**]). Through his conscious experience, time was a stream of changes of matter within space, with no reversibility possible, and the integration of time to space was complete only through that experience.

With the integration of time into the makeup of space, four-dimensional spacetime could be replaced with a three-dimensional space that goes through a stream of changes. The movements of stars and galaxies are then described within this evolving space, with **changes in space only indirectly measured locally by clocks**.

The added experience of transient quantum realities

By 1935, Einstein realized that an aspect of time and space not considered earlier was implicit in the physical approach that came to be known as "quantum mechanics," and he published an article on this subject with two of his colleagues. [**9**] QM was in effect telling him that the reality of a given particle evolution may be **multivalent**, and that observations by material entities in phys-

ics were in fact selecting which reality was to be experienced. Experiments were run decades later (called Einstein, Podolsky and Rosen or “EPR experiments”) to confirm this fundamental truth. They demonstrated the fact that a material system has indeed **transient realities** non-local **across space**. [**10**]

These experiments showed that two quanta (two “particles”), which have been together and then are sent in space in opposite directions, "know" each other’s state regardless of the distance between them (they are seen as “non-separated” in their dynamic evolution, even though apart from each other in space). When the spin of one particle is observed, the astounding experimental result is that the second particle’s spin can be “immediately” observed in a state related to the state found for the first particle (a complementary spin); the “knowledge” of the first spin transferred to the second particle needs to travel faster than the speed of light. While this transfer may not be simultaneous (limits on the experimental apparatus prohibits any proof of simultaneity), it nevertheless must connect the two particles across space regardless of distance in some fundamental manner.

As a result of this experimental fact, we can only conclude that a common reality exists called “classical reality,” and the **selection** is made by this reality **locally** interacting (observing) one of the transient realities of the quantum system, and selecting this reality as a whole ACROSS space. The other realities that are not selected by the observation can only be seen as going out of existence instantaneously, and as a whole, upon such a selection. This process of elimination is called a "wave function collapse" in QM. The observed quantum system is then a **matter-space system** comprised of **self-generated transient spaces** tied to the matter they contain.

There we experience timeless space in a direct way: as the **stream of reality selections**, a stream running across space that creates ordinary reality outside any model of time. Through conscious experience space is seen as timeless; changes run, but space is just there, unchangeable. As space is timeless, transfer of “knowledge” between quanta has to be immediate (“**information**” is thus undefined in a non-separated system until observed). But this understanding cannot be grasped through rational experience, conscious experience is needed.

Conclusion

The scientific picture of the universe is continuously improving towards what the universe really is. The geocentric model was improved through the heliocentric model, Newton’s space and time were changed into the spacetime of Minkowski and Einstein. A further development is obtained through a conscious experience: from spacetime to **timeless space** in which an irreversible stream of changes runs, time being only a “by-product” of the contents of space that change in such a timeless space.

On the other hand, via the model of General Relativity, rational experience was there to confirm Einstein's initial conscious experience that not only the content of space but space itself is changing according to its contents. Such a view needed the assistance of rational experience, for example by comparing clocks at common events, in order to ascertain the validity of the concept since not accessible to conscious experience.

However, Einstein's equation fails to connect the very existence of space to its contents, and thereby fails to connect the universe as a whole as conscious experience can reach. Quantum effects on the other hand, when seen through conscious experience, lead to such a connection, but in turn fail to identify the changing character of space according to its contents, as Einstein saw. This begs the question: Can the dynamics of the quantum act on space in other ways than through its mere presence? A future article will discuss a possible answer.

As the irreversibility of changes has demonstrated, conscious experience must be used in the first place to set rational experience, especially when it comes to devising its models (such as time), including the bounds of their validity and their conclusions. Rational experience of space and time is indirect, limited by geometrical models through which one **rationally** experiences them, while one can experience space directly through a **conscious** experience. Time can only be constructed via a rational experience as it is only a model, and thus not in the realm of conscious experience.

This last kind of experience thus represents not only an enrichment for scientific research, but a vital part of productive science. This is the conclusion Einstein also reached through his well-known statement

> "Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world," [**2**]

understanding here "knowledge" as rational experience.

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