Time, Space and Process

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Analytic philosopher Wilfred Sellars is moderately well known for his distinction between two ways people think about life, the universe and everything He calls them the manifest image and the scientific image. “Image” is a visual metaphor for a conceptual scheme. When we understand something fully, we say that we have a complete picture of it. Using “image” rather than “picture,” Sellars claims that the manifest image is a better way of envisioning human nature than the scientific. Physicist Carlo Rovelli claims that the scientific image is a better way of thinking about what is ultimately real. The process metaphysics of Alfred North Whitehead provides a way to accommodate both.

“Manifest” means obvious, unhidden, clear to the eye or mind. Sellars calls the first image “manifest” because it pertains to what can be observed in everyday life without instrumentation. The manifest image finds correlations between types of events and uses those correlations to formulate explanatory theories. In particular, it explains human nature and behavior in terms of personhood.[1] In this image, humans are agents in community with other agents, and we explain what they are and do by referring to their beliefs, intentions and desires. Sellars calls the manifest image “sophisticated common sense.”[2]

The scientific image goes beyond the manifest by postulating imperceptible entities such as atoms, molecules, fields of energy and the like to explain the behavior of perceptible things.[3] It uses a disciplined approach, the scientific method, to discover laws and regularities pertaining to such entities. Those who espouse this view to an extreme think that everything, including human nature and behavior, can ultimately be reduced to, and fully explained by, the elementary laws of physics.

Each of these views purports to define a framework that is complete, comprising the whole truth about its subject matter. The two views appear to be in conflict, at least concerning human nature. The notions of beliefs, desire and purpose have no bearing on the behavior of elementary particles, nor on everyday physical events like the blowing of the wind or the boiling of water, nor on the movements of the planets and stars. The notions of, say, elastic deformation or laminar flow or plate tectonics have no obvious bearing on human interaction and decision-making. Sellars’ conundrum is how to combine the two images. He wants to integrate sophisticated common sense and theoretical science to bring them together in a 'stereoscopic' view.[4]

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[1] Sellars, p. 11
[2] Sellars, p. 20.
[3] Sellars, p. 7.
[4] Sellars, p. 19

Physicist Carlo Rovelli takes note of the same dichotomy of views, but his focus is on the physical world and in particular the nature of time. One of the obvious features of life as we humans live it is the passage of time. He says,

> We conventionally think of time as something simple and fundamental that flows uniformly, independently from everything else, from the past to the future, measured by clocks and watches. In the course of time, the events of the universe succeed each other in an orderly way: pasts, presents, futures. The past is fixed, the future open. …And yet all of this has turned out to be false.[5]

The common-sense view of time, its manifest image, has three aspects:

- Time labels moments in the universe. It is a coordinate; it helps us locate things.
- Time measures the duration elapsed between events. It is what clocks measure.
- Time is a medium through which we move. We move through it, or—equivalently—time flows past us, from the past, through the present, toward the future.[6]

Time, in this common-sense view, is similar to space. We commonly think of three-dimensional space as having analogous aspects:

- We use space to label locations of things or events. It has its coordinates, the three dimensions, to help us locate things.
- Space measures the distance between things. It is what rulers measure.
- Space is the arena in which we live, move and have our being.

Both of these images are of containers. Ever since Isaac Newton we have thought of space as a big box in which we can locate things precisely on their X, Y and Z axes. Think of a place on earth, for instance Venice, Italy. Its geographical coordinates are 45.44° N latitude and 12.32° E longitude, and its average elevation is about one meter above sea level. We can add time as a fourth dimension. A hundred years ago it was at the same latitude and longitude but 23 centimeters higher. In Newton's view space and time are containers that exist independently of what is in them. But now, thanks to Albert Einstein's general theory of relativity, we know that the Newtonian view is not the whole picture.

[5] Rovelli, pp. 3-4.
[6] Carroll, p. 10.

That view works well here on earth near the planetary surface. But what if you were far away, out between the stars? There would be no up and down, no right and left, no forward and back. You could orient yourself only in relation to another object, not to any universal coordinates. In the absence of such coordinates, you could tell how far away something is from you only by how long it would take light to get there from where you are. Space is relative to units of time.

Similarly with time: time does not flow uniformly within a Newtonian box. The faster you go, the slower time flows for you. If someone travelled at an extraordinary speed to another star and returned, that person would be younger than people who were the same age as the traveler when he (or she or they) left. This would happen only if the traveler returned to the same point in space from which they left. If they never returned, there could be no comparison of their flow with that of those left behind. Time is relative to points in space.

The point is that in the physical universe nothing exists in isolation. Everything is relative to something else. Before a tiny quantum-level particle is detected, it has no actual location, only a field of probabilities. Only when it is detected, when it interacts with something else, does it have a definite location. The philosophical notion of substance set forth by Descartes—something that could exist by itself or, equivalently, something that does not depend on anything else for its existence[7]—is not a good account of what we actually find when we investigate carefully. It, along with notions of absolute space and time, is a component of the common-sense manifest image, but in this case the scientific image is superior. It yields more accurate predictions. It is, as Rovelli says, more efficient and helps us understand the world better.[8]

(Interestingly, the Newtonian view is a rather recent addition to the manifest image. Aristotle thought of time as the measurement of change. Things change continually, and Aristotle calls time the measurement or the counting of this change.[9] If nothing changed there would be no time. Similarly with space. Aristotle says that a thing's location in space is defined by what surrounds it. Space is the spatial order of things.[10] If there were no things, there would be no space. Newton's idea is part of our current manifest image only because several centuries of schooling has drilled it into our sophisticated common sense.[11])

But if time and space are not universal containers separate from their contents, then what are they? The current scientific consensus is that they are two aspects of one vast entity called spacetime, which is made of the same type of stuff as everything else. That type of stuff is field. Says Rovelli,

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[7] Weir (Internet Encyclopedia of Philosophy).
[8] Rovelli, p. 66.
[9] Rovelli, p. 63.
[10] Rovelli, pp. 69-70.
[11] Rovelli pp. 67-68.

> Physicists call “fields” the substances that, to the best of our knowledge, constitute the weave of the physical reality of the world.[12]

In common usage a field is a patch of ground, an expanse, like a football field or a field of corn. In physics, a field is such an expanse with the additional characteristic of having a value associated with it at each point in space or time. The value can be a single number, such as temperature on a weather map. The value can be two-fold, such as a surface wind map that shows both the force and the direction of the wind at each point. Or it can be three-fold or even more, such as an electromagnetic field that shows the interaction between an electrical and a magnetic force.[13]

There are many types of fields: electrical, magnetic, gravitational, electromagnetic, weak and strong nuclear force, and more. Of particular interest is the gravitational field, which describes the attractive force between two or more objects. Rovelli says,

> [It] is the origin of the force of gravity, but it is also the texture that forms Newton’s space and time, the fabric on which the rest of the world is drawn. Clocks are mechanisms that measure its extension. The meters used for measuring length are portions of matter that measure another aspect of its extension….[14]

In classical Newtonian physics, the gravitational field is thought of as a force existing in space. In General Relativity, the concept of a gravitational field is replaced by the curvature of spacetime. Instead of a force acting at a distance, gravity is understood as the effect of curved spacetime on the motion of objects.[15] Thus, Rovelli says

> Spacetime is the gravitational field—and vice versa.[16]

So far, all of this account of physical reality is well established and has been experimentally verified many times over. Rovelli goes a step further into an account that seems quite plausible but for which no experimental evidence has yet been found: quantum gravity.

The study of quantum gravity seeks to unify the theory of gravity with the principles of quantum mechanics. The term “quantum” comes from a Latin word meaning “how much” and signifies that the magnitudes of certain properties at a very tiny level can take on only discrete, not continuous, values. For example, electrons orbit their nuclei only at certain discrete distances, not in between, so the electron is said to be quantized. Quantum mechanics explains three of the four fundamental forces in nature: the electromagnetic interaction, the strong force, and the weak force. The fourth, gravity, is explained by Einstein’s theory of General Relativity. But there is as yet no clear

[12] Rovelli, p. 74
[13] Wikipedia, “Field (physics).”
[14] Rovelli, p. 74
[15] Opera (browser) AI response to prompt “Spacetime vs. Gravitational Field” 11 February 2026.
[16] Rovelli, p. 75.

connection between the two disciplines.[17] Rovelli, a leading quantum gravity researcher, posits that time also can best be thought of as quantized, occurring in discrete units.

> If we could measure the duration of an interval with the most precise clock imaginable, we should find that the time measured takes only certain discrete, special values. It is not possible to think of duration as continuous. We must think of it as discontinuous: not as something that flows uniformly but as something that in a certain sense jumps, kangaroo-like, from one value to another. In other words, a minimum interval of time exists.[18]

Time is not a uniform flow but instead is made of up tiny instants known collectively as Planck time after the scientist who first postulated it. A unit of Planck time is the smallest we can measure. Below that limit, the notion of time has no meaning. Similarly, there is a Planck length, the minimum limit below which the notion of length is meaningless.[19] Taken together these ideas indicate that reality itself is quantized, composed of very tiny units that are not further decomposable.

Rovelli calls them "events." The fundamental quanta of reality are not static things being pushed around in a Newtonian box, but happenings that constitute time and space as relations between them. Rovelli says, enthusiastically,

> The world is nothing but change….the world is a network of events….nothing *is*; things *happen*. …the best grammar for thinking about the world is that of change, not of permanence. Not of being, but of becoming.[20]

> We can think of the world as made up of things. Of substances. Of entities. Of something that is. Or we can think of it as made up of events. Of happenings. Of processes. Of something that occurs.[21]

Rovelli goes for the occurrence, or process, view, and he has a good reason for doing so. Theories are tools for understanding and mastering the world, and this approach works better at these tasks than thinking in terms of Cartesian substance. Rovelli's rationale echoes the American Pragmatists Peirce, James and Dewey as well as the later Wittgenstein:

> Thinking of the world as a collection of events, of processes, is the way that allows us to better grasp, comprehend, and describe it. It is the only way that is compatible with relativity.[22]

One might object that in the manifest image of reality, we certainly do find things as well as events. Rovelli replies

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[17] Wikipedia, "Quantum gravity."
[18] Rovelli, p. 84.
[19] Rovelli, pp. 83-86.
[20] Rovelli, pp. 96-97.
[21] Rovelli, P. 97.
[22] Rovelli, pp. 97-98.

> On closer inspection, in fact, even the things that are most "thinglike" are nothing more than long events. The hardest stone…is in reality a complex vibration of quantum fields …[23]

> The difference between things and events is that things persist in time; events have a limited duration. A stone is a prototypical "thing": we can ask ourselves where it will be tomorrow. Conversely, a kiss is an "event." It makes no sense to ask where the kiss will be tomorrow. The world is made up of networks of kisses, not of stones.[24]

All this sounds remarkably like Alfred North Whitehead.

Whitehead, a philosopher of the early 20th century, created a metaphysical scheme of ideas that he intended to encompass everything that we can experience.[25] He would quite agree with Sellars's take on philosophy:

> The aim of philosophy, abstractly formulated, is to understand how things in the broadest possible sense of the term hang together in the broadest possible sense of the term.[26]

He postulated, as Rovelli does, that reality is made up of atomic or momentary events, not inert particles. Unlike Rovelli, he posited that each event has two aspects, mental and physical. In a primordial way each event experiences its surroundings and is experienced by other events. This doctrine is known as *panpsychism*, the view that everything, from the smallest quantum event to the most complex living being, has an aspect of mentality as well as physicality. Everything has an inside and an outside.

At the quantum level, the outside, the physical aspect, is pretty much just as Rovelli describes it. Tiny quantum events come into being and pass away, combining with and informing each other to result in enduring thing-like objects. Whitehead's insight is that these tiny events—he calls them "actual occasions"—are, at least dimly, aware of each other. They each have an inside, an interiority. By that I mean that each one senses or feels aspects of its world—the world as experienced by it—that are directly detectable or observable in principle only by it itself, the entity doing the detecting or observing.

If that seems confusing, think of seeing a patch of blue sky. Only you know directly how that blueness appears to you. You can't look through someone else's eyes to see how it looks to them, and they can't look through yours. You can each see each other's exterior, your bodies and clothes, etc. But only you have your interiority and only they have theirs. Whitehead says, augmenting Rovelli, that that's how it is all the way down to the tiniest unit of reality.

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[23] Rovelli, p. 98.
[24] Rovelli, p. 98.
[25] Whitehead, p. 3.
[26] Sellars, p. 1.

This panpsychist insight provides the answer to Sellars' original conundrum, how to reconcile the manifest image of human beings with the scientific image. Whitehead supplies the desired stereoscopic view. In the manifest image, humans are persons who freely choose their actions based on their thoughts, feelings, desires, beliefs and intentions. They each have an interior, private to themself. That interior is not separate from their exterior, which is public. The public aspect is described and explained in different ways by the scientific image. But both images are of the same subject.

Different categories of explanation work for different ways of looking at the phenomenon of being human. You pick the category of explanation appropriate to what you want to accomplish. If you want to get someone to do something, you appeal to their beliefs and desires. If you want to cure them of a disease, you treat them with medicine that affects their biochemistry. Each image is true and useful in its own arena. There's no contradiction, just two sides of the same coin.

Both Rovelli and Whitehead recognize the limitations of classical Newtonian and Cartesian physics, and both overcome them in the same way. Both posit change and process as more fundamental than inert substance. Rovelli does cosmology, and Whitehead does metaphysics, so it's not surprising that Whitehead's philosophical program is the more comprehensive. Whitehead includes subjectivity, whereas Rovelli omits it. But both would agree that it's more productive to focus on kisses than stones.

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