

**BOOK REVIEW**

**Fred Van Oystaeyen:  
*TIME HYBRIDS: A NEW GENERIC  
THEORY OF REALITY***

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This book, *Time Hybrids*, describes an entirely new theory about the world, a major step in an entirely new direction of science and our understanding of the world. It offers multiple ways of rethinking almost everything, combining the abstract and the real, the observed and the non-observed, the existent and the non-existent in a purely geometric way, using a single generic model. It deals only with Time, which is simply defined as a totally ordered set of states. Between the states there are connection maps that deal with changes in the time intervals between moments, where a moment is an element of T. In this generic model, time is neither a set of real numbers nor a geometric line nor a vector space over the real or complex numbers. The only condition is that Time is a totally ordered set. Since time is one of the most elusive concepts for us, this new approach could or will have massive implications for the natural sciences and the way we look at the world.

**SOME BACKGROUND**

To understand this, we need to take a few steps back. The current state of science is that there are two main theories that govern the world and the universe, namely relativity and quantum theory. The general idea is that everything that happens in the world is governed by the laws that spring from these theories. All life is

controlled by chemical processes, which in turn are controlled by quantum theory. The basis of these theories is (pseudo) Riemannian geometry for general relativity and non-commutative geometry for quantum theory and phenomena. Both theories are mathematical in nature and there is little doubt that mathematics is the language to describe the world around us and to bring order to our observations of the world and its phenomena.

But where does mathematics come from? Where does it originate? Is it a completely abstract concept (or a collection of concepts) or is it a process that takes place in our brains? In an interesting dialogue between the neurologist Jean-Pierre Changeux and Alain Connes in the book *Matière à pensée* (Food for Thought; the title refers both to Descartes with his dualism between matter and mind and to *Les Pensées* by Blaise Pascal). The neurologist takes a materialist standpoint, according to which chemical processes in our brain are responsible for all our thoughts and abstract ideas, including mathematics.

Alain Connes (Fields Medal) sees mathematics as more abstract, where one cannot decide where it comes from or where it is located. One recognizes this as Platonic. The book is more than two decades old, but due to its success it was reprinted and slightly updated in 2022. Alain Connes is famous for his work on non-commutative geometry. The author of *Time Hybrids* has built a long career in abstract algebra and non-commutative geometry with numerous books and articles. An important question is how non-commutative geometry will affect the way we think about the world compared to what we know today. And an answer to that is given in this book, with far-reaching consequences.

## **FROM ABSTRACT TO ABSTRACT WITH TIME**

The geometry of the ancient Greeks was very general and very abstract, in the sense that it is completely independent of the world around us (with our observations of space and time). In modern times this geometry was applied to the natural world by Galilei, Kepler and Newton, with the emphasis on space and time being a separate parameter. In the early twentieth century, space and time were combined to form spacetime. This space-time is the universal theatre in which everything happens (and happened). On the other hand, geometry also became more and more abstract in the spirit of the ancient Greek mathematicians.

Tangents to curves developed into tangent spaces, which were further generalised

into fibres and fibre bundles, foliations, and sheaves. Furthermore, we observe an increasing abstraction in geometry that focuses more and more on the space in which an object is embedded, in submanifold theory.

In *Time Hybrids*, the author turns this completely on its head and argues that abstract space is the place where everything happens. This idea stems from his work in non-commutative geometry, where the commutative space we “observe” (except for time) is a shadow of non-commutative space. And everything means Everything! Everything that does not exist (only as pre-things in a void, as part of a strings of pre-things), that has a possibility of existing (through interactions between pre-things and strings) and that exists through our observations. He thinks of an etale, a concept that goes back to Grothendieck, but which is best understood by what it means in French: a calm sea, in this case a very extended one. In this etale there are strings of pre-things that extend very far. These pre-things can interact and eventually transform into observable things, in a time interval of the totally ordered set Time. The author writes: *“Our generic time in reality is not in the Universe; the universe  $U$  is an etale structure over the set  $T$  of Time as a set of abstract moments.”* But before it turns into observable quantities, there are many possibilities of interaction in the etale (which may or may not “materialize”; or rather “timelise”). Creativity and free will, for example, become a given. Creative thoughts and free will originate in actions between processes that we may not become aware of until later, when they “timelise” in our brains.

## OFF THE CHARTS

From a scientific point of view, the generic model does not presuppose time to be anything other than a fully ordered quantity. If one chooses to use real or complex numbers, a geometric line, or a vector space over the real or complex numbers, such additional assumptions give rise to relativity and quantum theory as special cases. If one assumes probability or certain metrics, other existing theories result. But how does the abstract interact with us humans? The title *Time Hybrids* is explained in the introduction to the book: *“This model fits: first there was the word...and the word became flesh. Indeed, the non-existing pre-things in a momentary state are abstract, non-existing, these are sets of “codes” or “letters” and can be seen as words in pre-things, they become existing via strings over time intervals. .... The understanding of our observation processes leads to the construction of our abstract world, that is the collection of all meanings, concepts, theories, ..., we invented in our cognitive*

*activities. These do not exist but that is exactly providing us with the possibility to step partially out of time with our non-existing concepts lingering on in our abstract world, concretely on information carriers and abstractly in memories. That makes humans time hybrids!”*

*Time Hybrids* is a fascinating book with a wide range of ideas (or consequences of its generic theory, as the author says). This new model is off the charts in terms of a paradigm shift so often used in the sciences. New truly fundamental ideas are rare and what is particularly interesting is that they come from a mathematician who is well versed in both geometry and abstract algebra. His position is Platonic, like many mathematicians, but the author argues very convincingly that the abstract is essential and that our observations (and the “meanings” we assign to those observations) are only part of the story.

In the reviewer’s opinion this aligns exactly with how Plato described his ideas in his Seventh Letter (to Dionysos): “For everything that exists there are three instruments by which the knowledge of it is necessarily imparted; fourth, there is the knowledge itself, and, as fifth, we must count the thing itself which is known and truly exists. The first is the name, the second the definition, the third the image, and the fourth the knowledge ... Of these things intelligence comes closest in kinship and likeness to the fifth, and the others are farther distant”.

In *Time Hybrids*, at least in my view, these five stages are all represented, with the fourth stage (knowledge, intelligence and right opinion about these things) and the fifth one (completely abstract). In this sense this new theory is not so new, but ultimately a true Platonic mathematical theory, in which timelessness and change (Parmenides versus Heracleitos), determinism and creativity, life and the non-living, evolution and coevolution, all find a home. It is ultimately a book about humans and our place in the world. As a final remark: these ideas can also be found in a more accessible book - *Journey to the source of laughter* - by the same author.

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