

2 When is Now?

Time is regularly separated out into three distinct components, the past, present, and future. We may seek an answer to the question of what time is by looking separately at these three components.

The *past* still only ever abides in our *present* memory or memories of it. It is as though we live in an eternal present, and reality, life, and time itself all stream past before us, carried along by an ever-changing swirl of events. It would be tempting to believe that we somehow live outside time (solipsist philosophers have tried this approach), but unless we are not our bodies, it does not work: we grow, age and die, thereby somewhat unfortunately proving how firmly anchored within time we are.

We live in the present: our whole lives happen there. But if we think about it for a minute we must surprisingly conclude that the *present does not seem to exist*. Had not Einstein once commented in frustrated puzzlement, in a conversation later reported by Rudolf Carnap, “*There is something essential about the Now which is just outside the realm of science*”?

The French poet Alphonse de Lamartine echoed the same feeling when he once pled “O Time, please just freeze for a moment!” (5) There is no single instant of time, however small, that we somehow can seize hold of and safely call ‘the present’. By the time we even begin to perceive a moment in time or apprehend an event, no matter how short, it already firmly lies in a fast-receding past. As the boundary wedge between the past and the future, the present needs to have a *non-zero* thickness to lay claim to actual existence. But no matter how close and hard we look, the edge between the immediate future and the fading past seems to have no materiality at all and no existence.

Maybe a good way to try and analyze the issue is to again reason by contradiction, and put what-if scenarios to the test: if the present does not exist, then perforce *we live either in the future or in the past*. Do we then exist in a fast receding, very recent past, or in a not yet materialized future, rather than in a non-existent, indefinable and ungraspable present?

We demonstrably cannot be living in the future. However immediate, the future is not yet materialised, and we do not live our lives immaterially. Hence, we do not live in the future.

Could we then simply define the present as an arbitrarily short time-slice of immediate past? This does not work either. There is no *qualitative* difference between a point in time one second ago or 5 million years ago: the difference is only *quantitative*. To say that we actually live within a brief slice of time bounded by two time boundaries which both lie within the immediately recent past, is not qualitatively different from saying that we live sometime last week or last year.

Moreover, there is mathematical proof that we do not live in the past. Downstream in time, the past is now set and immutable: it is cast in stone, and we can no longer change it (6). However, our lives are *demonstrably* not robotically playing out

foreordained scenarios: Heisenberg's Uncertainty principle, which we will cover more at length later, effectively forbids immutability, and indeed, predestination (7). Therefore physics, via the uncertainty principle (named after the physicist Werner Heisenberg) demonstrates that we actually do not live in the past.

There are a few possible ways out of the conundrum of what the present is.

One possibility consists simply in resolving the whole issue by taking the view that time does not exist. Time itself would then be an illusion. This approach has been tried in various ways, such as eternalism, also called the *block universe* view, or in a different rendition, the *growing block universe* (8): The block universe view directly derives from viewing time as a dimension, qualitatively no different from height, width or length: the universe is made up of a block of four dimensional space-time, where the four dimensions, three spatial dimensions and one of time, make up a coherent, four-dimensional space-time. Following a recurring theme when discussing time, it will be shown in this book that there is overwhelming evidence both that this view is at least in part correct, *but* that it is not the whole tale.

Yet another possible solution consists in saying that within our universe, time is not continuous. Under this view time would be made up, for lack of a better image, of a strobe light-like succession of extremely short moments frozen in time, when nothing can change, anywhere in the universe. Time would then proceed from one moment to the next by discrete quantum 'jumps' from one node to another, a succession of infinitely small frozen presents on an underlying time grid-like loom: the weft of time would be discontinuous (also called *discrete*.)

Various combinations of these interpretations could also work: time could be a discontinuous dimension in a wider block universe already containing a future, or an emergent property of the universe whereby time is either continuously created, or generated by a succession of frozen instants, or something else.

Before we can proceed and explore these and other solutions to the conundrum of now time, we *must* arm ourselves with a few simple tools.