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The Shifting Consolations of Time

by Tasneem Zehra Husain

Even the most cerebral of us can deal in abstractions only so far. No matter how grand the statement, how magnificent the law, how awe-inspiring the philosophy, there comes a point when, inevitably, we ask: but what does it *mean*? " An interpretation of the universe remains unsatisfying unless it covers the interior as well as the exterior of things; mind as well as matter," wrote Pierre Teilhard de Chardin.

Overarching principles condense the workings of this vast, varied — and often puzzling — universe, into a set of predictable patterns, but order alone is seldom enough to satisfy us. We want to make sense of things - particularly those we cannot control. When exerting influence is not an option, often our only consolation lies in understanding what is, and reframing it in a way that we can live with.

Time is one of the most fundamental concepts that forms the invisible scaffolding of our lives. It is woven inextricably into all our logical structures, all our ways of being; we are conscious of moving though it - or being swept along by it. "Time perception matters because it is the experience of time that roots us in our mental reality,' writes Claudia Hammond. The arrow of time sets the direction in which our stories unfold, we comprehend the world by sorting phenomena into causes and effects.

Time is always implicit in our study of natural phenomena; the basic tenet of most physical theories is the ability to make predictions, to forecast the future, to trace the evolution of a system. Through the centuries, even as we constructed equations that employ and exploit time, we continued to ponder the true nature of this ubiquitous, slippery commodity.

The most monumental shift in perspective came with the theory of Relativity. Time was revealed to be elastic where we had thought it rigid, relative where we had thought it absolute. Adopting this new paradigm was not easy; there were many paradoxes to resolve first - twins aging at different rates, for example, or the universal conspiracy to let light win every race. These strange new notions of time were dictated strictly by equations and logic. They had no counterpart in our visceral knowledge of time - they

were counter intuitive, and hence difficult to accept.

It turns out, however, that even intuition can be cultivated. A few decades worth of exposure to these ideas, through films and books and popular culture, have primed our collective consciousness so that young people nowadays no longer struggle nearly as hard with relativity as did their counterparts a few generations earlier.

Most of us are familiar with some version of this story, and are probably even aware of some of the famous experiments that provided proof for, and led to the acceptance, of relativity - but we don't often discuss how we truly came to accept changing nature of time; how we learnt to formulate our shifting understanding in words we can derive comfort from.

Our natural inclination is to think of time as rigid. At the back of our minds, we all hold an image of a ruler that marks instants in time; a a number line we slide along inexorably, always at the same speed, and in the same direction. Isaac Newton conceived of time in precisely this way when he wrote "Absolute, true and mathematical time, in and of itself, and of its own nature, without reference to anything external, flows uniformly."

The consolation of this worldview is as instinctive as the notion itself. Absolute time is comforting in the classical sense. It implies a layer of structure that is transcendent, unsullied by the irregularity and messiness of life, untethered to our imperfect, human, clocks. This kind of time has all the appeal of a Platonic Ideal - it is consummate, primordial, sublime. It represents a heavenly perfection we can only aspire to, never achieve. Time becomes that elusive thing that is in our reach but not our grasp, as Browning would say. By virtue of being absolute, Time offers us a glimpse of what Newton called "the sensorium of God."

While we still wear the shackles of our mortal coils, the movement of time, its perfect beat, is something - perhaps the only thing - we can count on, in this world of vagaries and whims. In his exquisite novel Einstein's Dreams, Alan Lightman describes Newtonian time as "a vast scaffold ... stretching across the universe, [which] lays down the law of time equally for all. In this world, a second is a second is a second. Time paces forward with exquisite regularity, at precisely the same velocity in every corner of space. ... Time is the reference against which all actions are judged. Time is the clarity for seeing right and wrong."

Enter Einstein, and a world where time is so far from absolute that the only meaningful definition we can construct depends on not one clock alone, but entire systems of clocks!

If - as some popular paraphrasing seems to suggest - relativity simply implied that our perception of time is personal and need bear no resemblance to anyone else's, Einstein would merely be restating what writers have commented on down the ages, from Shakespeare, who declared that "time travels in divers

paces with divers persons," to Virginia Woolf who wrote "an hour, once it lodges in the queer element of the human spirit, may be stretched to fifty or a hundred times its clock length; on the other hand, an hour may be accurately represented on the timepiece of the mind by one second."

There is much more to relativity than just this! Einstein framed his theory in terms of invariants - quantities whose values we all agree on, across the particularities of our individual reference frames - and then went on to pen a dictionary of formulae so that we can each translate our distorted 'external' views of other people's experiences, into reality as it is perceived by them.

In the process of establishing these equivalences, Einstein discovered many truths about spacetime, one of which was the fact that time does not flow, or sweep us along, any more than space does. Time does not unfurl as we move through it, any more than space is created as we step in new places. That we perceive just one temporal slice at a go, is a peculiarity of our perspective; it is not a statement about the reality or simultaneous existence of all other moments in time. All of time, as all of space, exists already.

Einstein could not have extrapolated this truth from his physical experiences, but he believed in the framework of relativity, and since this is what the theory implied, he took it to be true. In fact, he took it even further; he lifted it from an objective, abstract truth, and took it to heart - he found a way to make sense of it.

When Besso - Einstein's lifelong friend, confidant and sounding board - died, Einstein sought comfort in this unexpectedly contemporaneous nature of spacetime. In a letter to Besso's widow, Einstein wrote "He is now a little ahead of me in bidding this strange world farewell. That means nothing. For us devout physicists, the distinction between past, present and future likewise has no significance beyond that of an illusion, albeit a tenacious one."

The theory of relativity does not distinguish between past and future, or place any particular emphasis on the moment we call 'now.' Bertrand Russell explained it thus: "The felt difference of quality between past and future ... is not an intrinsic difference, but only a difference in relation to us; to impartial contemplation, it ceases to exist." If all the places we do not presently occupy continue to exist, then so do all the times we do not presently inhabit. Relativity implies that a separation in time is no more or less real than a separation in space.

But what does this mean? Michael Lockwood spells it out beautifully It means, he says, "that death is not the deletion of a person's existence. It is an event, merely, that marks the outer limit of that person's extension in one [time] direction, just as the person's skin marks out the limit in other [spatial] directions. The space–time view is, therefore, inconsistent with our regarding one of those limits, but not the others, as a cause for sadness."

On the nature of time, Einstein and Newton's perspectives could not be further apart. Crossing the intellectual chasm between these two theories was a monumental accomplishment, a powerful endorsement of the ingenuity and flexibility of the human mind. The ability to find beauty and solace in these two vastly different concepts is an equally strong testament to the range and artistry of the human spirit.

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