THE TONY CHADWICK PRIZE 1998 RUNNER-UP ESSAY (THE BOETHIUS PRIZE)

THE JANUS NATURE OF TIME

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I found Michael Lockwood's recent course on the Nature of Time for the most part difficult, always exciting, and finally transforming, for I brought to the course two quite separate intuitive ideas about time, and left with a much more satisfying world-view in which these two ideas were closely interwoven. One idea was connected with matter as it exists, the other with our perception of events, and, because of their interaction with various parts of the course material, I gained a better understanding (far from complete) of a Janus-like nature of time, which I would like to explain. Since I am neither mathematician nor physicist, nor trained in philosophical ways of thinking, what follows is necessarily a layperson's view of the nature of time, yet I hope it may provide a model, however rough, to help others who are equally 'naive', to visualise some aspects of relativity.

Several years ago I was present at an informal talk on time given by a retired professor, and, though I cannot now remember the details of the talk, I must have taken on board some notion of the connectiveness of motion, matter, and time. Intrigued when our hostess said that she could not imagine a world without time, I tried to do just that, starting by mentally stopping all the clocks, etc., all motion in atoms, and so on, until it eventually dawned on me that, if time stopped, and with it all motion in the world, the world itself must cease to *be* (the same thing, at any rate). I was left with the intuitive idea that the smallest motion, or change, in matter brought time into being, and that time and motion/matter were somehow inseparable. This idea expanded during the course, due mostly to the trouble I experienced with the 'clock paradox', where clocks taken on very fast plane journeys, and those at the top of very high towers, measured different times from a similar clock at ground level on Earth. It was, in the main, an intuitive unease that something was missing in the explanations that time slowed down in different conditions of gravitational potential or acceleration. After a while I realised that gravitational potentials, accelerations, and varying speeds of time were *descriptions* of what was being observed, namely, the behaviour of (similar) matter under different conditions. The clocks, being similar in construction, did not so much describe *time* as slowing, as describe the behaviour of matter as changing - for the clocks themselves were matter in the universe, reflecting differences in the conditions in which they each were existing. My basic idea (of matter changing and bringing time into being) was transformed into a visualisation of matter spread out in the universe such that areas of different gravitational potentials obtained, and this matter continually, but unevenly, changed (like the leading edge of a sea-wave in the analogy mentioned by Michael), creating time in a special way, which will be explained later. First I must outline the second idea mentioned earlier, before linking the two together.

Many years ago, in a very brief but interesting introduction to the sciences with the Open University, I learned that the sun's rays took about eight minutes to reach the earth, and so we only saw a sun which had already existed (and which may not exist at the moment of our perception). This odd fact made a deep impact on me. More recently I came back to the problem, this time with a broader knowledge base, and thinking in terms of my perception of my 'here' and 'now'. I worked out some rather disturbing features of this 'now', which will be demonstrated best by means of the following thought experiment.

Imagine you are sitting in a room with several other people, some close by you, some at the furthest end of the room. You look through the window at the sun shining, and realise that the sun you see now is the sun as it actually existed about eight minutes ago - it is a representation, so to speak, of a past event. You look at the people at the far end of the room and realise that they, too, are seen fractions of a second after the light leaves their bodies to travel to your eye, while people closer to you are seen even smaller fractions of a second later. The further away in space objects are from you, the longer light takes to travel for perception to take place, and thus the further back in time their existence is from the moment of perception. So your 'now' consists of a collection of perceptions which refer to several different moments in the past (and this holds for all other sensory perceptions, too). This 'now' which you experience is completely subjective, for if you walk across the room to the furthest end, you change your relations with everything in the room, the closest previously now being the farthest away and vice versa, and so the perceptions change their 'pastness' (if it can be expressed so). At this new position, your 'now' has a new set of 'histories', and so your position ('here') affects the contents of your 'now'. Everyone occupies a unique position in space, perceiving their own unique 'now', and so, in some sense, we do not share in common the 'now' as we normally speak of it. From this point of view, the statement: 'The collection of events simultaneous with our local "now" defines the boundary between the past and the future' (Flood & Lockwood, 1986), cannot be correct, in terms of perception, at any rate, for the collection of events perceived as simultaneous to our 'now' have been shown to be already in the past. This should appear less paradoxical as the argument unfolds.

Two things are demonstrated in the above thought experiment: the first is the almost banal observation that perception always takes place after existence (of the thing perceived); the second is that our 'now' is, of its very nature, bound up in the Einsteinian relativity of frames of reference - as individuals we each have our own unique frame of reference.

In the interests of clarity, in the following discussion the term 'perception' will be replaced by 'experience', in such a way that experience means the simplest kind of experience, i.e. reception of information about the world through our sense organs.

It seems inarguable, given the nature of experience (as shown in the case of visual perception above), that experience of something takes place at a later time than the moment of existence of that thing. The time term 'now' when used for both existence and experience simply cannot

indicate one and the same moment. Both moments occur, however, and need terms of reference, so the term 'Now' will be used to indicate the time of existence, while the ordinary 'now' will stand for the time of experience.

What could it mean, then, to talk of a time of existence? We know what we are speaking of when we normally talk about the now of experience, for it comprises all the things we see, hear, feel, etc., in the world around us, particularly locally. What would we be talking of the Now of existence comprising? Well we are part of the universe, and we, too, participate in the universe's unfolding, or whatever way one prefers to describe the ever-changing state of the matter in the universe. We exist in the Now in the objective sense of being a certain state of matter in a certain position in the universe as it exists in that Now. Perhaps one could argue that any change, however small, in any of the states of the matter in the universe, causes a relational change in the *overall* State of the universe, and thus results in a 'State-after' for the universe. These States-after would be the successive Nows we speak of when we talk about the time of existence.

At the level of existence there are only the raw changes in the state of the matter in the universe, and these take place at specific points in space, creating (or being) the moment of the Now; they remain no longer in existence to *be* in a 'past', and cannot attain existence yet to *be* in a 'future', they simply *are Now*. We at the level of experience are not aware of the minute changes taking place at these infinitely small points in space, even in our own bodies, for we 'straddle' both space and time. Not only are our bodies extended (over space), but our 'now' also is extended over time - 'The experienced now is not a point, but is extended' (Ruhnau 1995). In this scenario we may never be 'aware' of the Now even though it constitutes our very being, and it is suggested that this Now is the 'real' objective time, while our ordinary notions of time, subjectively constrained by locality, are more concerned with making sense of the behaviour of matter in the world as we experience it. For instance, our accelerated travel (in space) which seems to defy time by leaving us younger, takes place in a series of the universe's successive Nows - our astronauts still live through the same *objective* time as the people left on Earth, while the apparent difference in time is due to the different conditions affecting the astronauts and their environment (spaceship, etc.) during travel, compared with those affecting the body at rest on the surface of the Earth. With matter spread all over the universe in varying degrees of change, one could think, perhaps, of the region of most frequent changes as being the one which leads the edge of the 'wave' of the Now, for it will more often form the latest State-after of the universe's Now, carrying the 'slower' regions with it in a relational change of state. However, this idea cannot be confirmed, since, as has been argued, such a boundary cannot be directly observed, and any calculations made must use subjectively determined measurements, as in the clock 'paradox', which automatically introduces many frames of reference with, so far, no authority pointing to any one frame as having precedence over the others as the 'true' one.

Normally, events need to exist over many successive Nows in order to be perceived in the (lengthier) 'now'. As we become capable of 'observing' events of very short duration, for example, at quantum level, it seems natural that difficulties will occur, for the interval between

the Now of existence and the observation of that existence becomes exceedingly small. Perhaps the 'periodic occurrence of backward causation' - noted as a problem for some theories by Michael (Lockwood, 1997) - is connected with 'glimpses' of the Now, which, as has already been argued, is normally always in the future of the 'now' - this could give the *appearance* of backward causation at such very time-interval-sensitive levels between being and experience, and such an idea from this viewpoint would not run into problems of 'supernatural' intervention in the present ('now') (I speculate, of course, from a very limited base of knowledge of physics.)

One more thing to be noted is that events which *exist* simultaneously are not *experienced* simultaneously, but at different 'nows' later in time, and thus the 'future' we talk about, in our experiential world, is in some sense not totally 'open', since it contains events which are (or *were*) actualities.

To sum up then, time appears, Janus-like, to have two faces. One is blind, forward-facing, and, turned away from us, it forever changes, lacking the stability of the backward-looking face we experience in retrospect, so to speak. Wherever we look into space, we see further and further into the past (even radiation from the beginning of the universe), while the future is ever hidden from our sight.

References

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