



Time Event

St Patrick's Triam, Armagh, 26 October 2003

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"Only time has this peculiar quality which makes us feel intuitively that we understand it perfectly so long as we are not asked to explain what we mean by it."

G.J. Whitrow¹

What is Time?

The nature of Time has been a mystery ever since mankind's early attempts to measure it by counting the diurnal cycle, the phases of the Moon and the slow march of the seasons. We usually think of it as moving forward at a steady pace; yet we are equally aware of its elastic and sometimes paradoxical nature. Sometimes it races by, for example when we are enjoying ourselves (or perhaps fast asleep), or it can slow to a crawl during periods of boredom (or while waiting for something to happen). Sometimes it seems to freeze, when all our senses are alert due to an accident or imminent danger; and occasionally, as in a dream, a story lasting hours can be made up almost instantaneously in the split-second between sleep and wakefulness. 'Mental' time has that elusive ability to speed up or slow down throughout our lives. It certainly does not appear to obey the rules of science!

Another facet of time is its forwards/backwards asymmetry. We are all familiar with time's sense of direction, the so-called 'arrow' of time. In scientific terms, this can be understood as a trend towards increasing disorder and decay. In human terms, "Men talk of killing time, while time quietly kills them" (Dion Boucicault). Time's asymmetry is also illustrated by

¹1912–2000. Pioneer of the modern study of time.

the *uncertainty* of future events compared with the certainties of the past; and by the *hope* that we often have for the future, compared with *regret* for the past.

It is a curious paradox that whilst the past determines the future, the extent to which this can be put to practical use is rather limited. Not just do we need precise knowledge of the present in order to make firm predictions, but it is essential that the systems concerned are relatively simple, and not the complex, often chaotic structures frequently encountered in nature. In the words of the Danish physicist Nils Bohr (1885–1962), who was awarded the Nobel prize for physics in 1922, "Prediction is very difficult, especially if it's about the future".

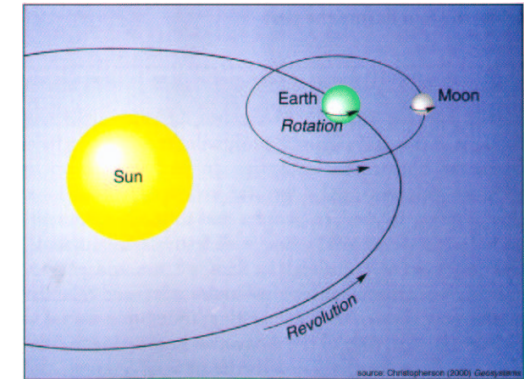
Thus, we are used to seeing the future indistinctly, like the approach of an acquaintance through thick fog. The closer it comes, the more we discern, until it finally crystallizes as the present — here and now — immediately to be lost, almost irretrievably, into an ever expanding past.

In summary, whatever scientific advances there may have been in our understanding of time, our intellectual and emotional responses to time's passage remain extremely complex. Despite our day-to-day familiarity with the word 'time' and our increasingly sophisticated scientific measurements of time, there are large gaps between our everyday experiences of Time's passage, our scientific use of the term, and the impact of 'time' on other fields. It is clear that a coherent understanding of 'time' must ultimately encompass both scientific and 'human' viewpoints, and one aim of the 'Time Event' is to explore some of the complexity of time as seen from both perspectives.

Scientific Time

The accurate measurement of time has always been one of mankind's great preoccupations. Early attempts were based on the rising and setting of the Sun and Moon, dividing the day into hours whose length varied markedly with the season. Later, this approach was quantified by the invention of ever more complex

sundials — a second measure of time based fundamentally on the supposed steady rotation of the Earth on its axis and its annual revolution around the Sun.



Rotation of the Earth and its annual revolution. Image taken from http://www.geography.uoregon.edu/shinker/geog101/lectures/lec02/lec02_figs/Earth-revolution-and-rotation-fig2-13.gif.



The Armagh Observatory sundial, image by J. McFarland.

Galileo's discovery of a natural periodic process that could in principle be repeated indefinitely — the swinging pendulum — opened the door to the invention of increasingly delicate and precise instruments for measuring the apparently uniform 'passage' of time. Our fundamental time unit, the second, is now defined

in terms of the periodic oscillations of radio waves produced by transitions between a pair of very sharply defined energy levels in the element $^{133}\text{Caesium}$ (Cs), hence the 'atomic clock'.

The question of the 'origin' of time is bound inexorably with our view of the origin of the Universe. Archbishop James Ussher (1581–1656) argued that the origin of the Earth, and of time as we know it, began in a moment of creation some 6007 years ago. Modern cosmology dates the origin of the observable Universe to another singular event, about 13,700 million years ago, associated with the so-called Big Bang. Although this is a huge time-span, it is only three times the age of our Earth, now dated to approximately 4,566 million years ago. Many cosmologists are now researching the question, what happened before the Big Bang?



The Hubble Deep Field: one of humanity's most distant views of the Universe. Some of the faintest galaxies shown in this image, taken by the Hubble Space Telescope in December 1995, are more than 10 billion light years away, a look-back time more than twice the age of the Earth. (<http://antwrp.gsfc.nasa.gov/apod/ap000709.html>).

The age and size of the known Universe are almost unimaginable. Even those among us who have travelled the world will have experienced only a minute fraction of the total space available, and in the same vein none of us experience more than an almost infinitesimally thin slice of time. Using an analogy sug-

gested by Richard Dawkins, if the history of the Universe were written at a rate of one century per page the whole of human history would fill only a slim paperback; but the rest would require an encyclopaedia 10 miles thick.

This presents us with one of the more difficult challenges thrown up by modern science: namely, how to reconcile the brevity and apparent insignificance of our own existence with the vast age and size of the Universe in which we are born.

With the origin of the Big Bang came also the origin of *space*. However, whereas you can visit and revisit points in space as often as you like, it is impossible to revisit the same points in time. As Heraclitus (fl. 513 BC) remarked: "No man ever steps in the same river twice, for it's not the same river and he's not the same man."

Time is different. We revisit the past only in our memories, or through observable geological or historical records (and our changing interpretations of these data). But the future, potentially infinite in extent, remains stubbornly elusive.

Human Time



Father Time Overcome by Love, Hope and Beauty (Simon Vouet, 1627, Museo del Prado, Madrid) (<http://www.kfki.hu/~arthp/art/v/vouet/2/01timelo.jpg>).

We have already touched on the diverse properties of 'mental' time: how it can sometimes run, or

walk; and occasionally stop still. In fact, our human experience of time is even wider than this, and can sometimes elicit a surprisingly raw emotional response, rooted in frustration at Man's mortality and the human condition:

The innocent and the beautiful
Have no enemy but time.

W.B. Yeats (1865–1939)

Time's relentless march beats out our mortality and makes no exception. We constantly observe the changes wrought on us and all around us by its passage:

Gather ye rosebuds while ye may
Old time is still a flying:
And this same flower that smiles to-day,
Tomorrow will be dying.

R. Herrick (1591–1674)

However, although there is no escape from our allotted time-span, our physical mortality, people always leave something of themselves behind in the legacy of a life's work or simply in the memories of others.

Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time.

H.W. Longfellow (1807–1882)

Moreover, the passage of time is a great healer. Our ability to remember the past and reflect on our experiences is one of life's greatest comforts. Sometimes we only fully appreciate events in our lives when we savour them as memories — the golden summers of our childhood, or the so-called 'good old days'. In this way, the passage of time changes our view of the past.

Thus, time's lengthening perspective continually changes our view of the world and our understanding of the past. Whilst present events, and those still to come, cannot change the facts of the past, our *perception* of past events changes with time, and history becomes a hostage to fortune.

Speakers

John Barrow: “Time: A Guide for Travellers”

John D. Barrow FRS received a doctorate in Astrophysics from Oxford University in 1977, and held positions at the Universities of Oxford and California at Berkeley before taking up a position at the University of Sussex in 1981. A prolific author, he is Professor of Astronomy and Mathematical Sciences, and Director of the Millennium Mathematics Project, at the University of Cambridge, and is Gresham Professor of Astronomy, Gresham College.

John Barrow's talk will review some of the curious features of time in modern cosmology and physics. He will look at the possibilities and consequences of time travel, whether time had a beginning and whether it will have an end.

Iggy McGovern: “Time, Chime and Rhyme”

Iggy McGovern was born in Coleraine and now lives in Dublin, where he is Professor of Physics at Trinity College. He has had poetry published in *Fortnight*, *Poetry Ireland Review*, *The Honest Ulsterman*, *The Sunday Tribune New Irish Writing*, *Metre* etc. In addition to his research in solid-state physics, he is holder of a McCrea Literary Award and a Hennessy Literary Award for Poetry.

Iggy McGovern poses the question: ‘What is the dimension of the present moment?’, and takes a wry look at the treatment of Time in selected poetry.

Malachi O’Doherty: “The Personal Experience of Time”

Malachi O’Doherty was born and brought up in Belfast. Currently the Managing Editor of *Fortnight* magazine, he is a regular columnist in the *Belfast Telegraph* and broadcaster on BBC Radio Ulster. He is a frequent commentator on political affairs, and writes commentary, opinion pieces, features and news.

Malachi O’Doherty notes that time as measured by clocks, whether the one on the mantelpiece or the one in the sky, passes in even measurable steps. That is not how time is experienced subjectively. Some things in the past still seem very close, others unutterably remote. A child’s wait for Christmas is longer than a parent’s. Drawing on his memoir *I Was A Teenage Catholic*, Malachi reflects on the plasticity of time, the presence of the past, the absences from memory.

Additional Contributions

In addition to these formal contributions, there will be an opportunity for general discussion, and for the audience also to contribute their views, personal or otherwise, about Time.

The Society

The Armagh Natural History and Philosophical Society is a small community organization, seeking to grow and improve the quality of its contribution to the wider community. It is one of the oldest learned societies in Northern Ireland, having been established in 1839 following the foundation of the Armagh Mechanics Institute in 1825. Its object is: “the promotion of the knowledge of Philosophy, Natural History and Archaeology”.

The Society acquired the former Mall School in 1856 and developed a museum, library and reading room, its collection ultimately being taken into the care of the Armagh County Museum, now in the same building. The Society retains its fine reading room which occupies the full extent of the Museum’s columned facade, and meets in the Museum approximately every two months. Those who are interested in the pursuit of knowledge, open-minded debate and the exchange of ideas, are invited to obtain more information about membership of the Society by writing to the Secretary, c/o The Armagh County Museum, The Mall East, Armagh BT61 9BE.

The Observatory

The Armagh Observatory (see <http://star.arm.ac.uk/>) is the oldest continuously functioning astronomical research institute in Great Britain and Ireland. Founded by Archbishop Richard Robinson in 1790, it stands close to the centre of the City in attractive, landscaped grounds which include the Armagh Astropark (a scale model of the solar system and the Universe; see <http://star.arm.ac.uk/astropark/>), and the Armagh Planetarium.

The Armagh Observatory’s main function is to undertake original scientific research of a world-class academic standard that broadens and expands our understanding of astronomy. The Observatory also has a unique, and scientifically important, 200-year long meteorological record (<http://climate.arm.ac.uk/>).

Whilst astronomy is primarily a scientific and technologically driven field, the ‘inspiration’ of astronomy encompasses both Arts and Science, including music, the visual arts, literature and philosophy. The recognition that the Earth is an almost unimaginably tiny speck in a vast, expanding Universe that began approximately 13,700 million years ago, is perhaps one of the major intellectual achievements of the twentieth century. However, Time plays a dual role, first as a parameter to describe the evolving Universe and the location of events in a more complex, scientific ‘space-time’ (and how to reconcile this with our knowledge of quantum mechanics), and secondly as a subjective human ‘emotion’, used to distinguish different manifestations of the evolving world about us. The subject of Time thus lies at the heart both of modern science and of cultural endeavour.



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