

nt&Letters

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Bono's honorary knighthood

Madam, - If Bono had moved part of his business from the UK to avoid tax would Tony Blair have offered him a knighthood for his humanitarian work? U2, as has been widely reported, moved part of their business from Ireland to avoid tax when the Government abolished the unlimited tax free status enjoyed by artists in favour of a very generous of, €250,000 tax free allowance.

However, while many people may find Bono's double standards amusing, they do raise a very profound issue: how will governments ever raise enough revenue to fund aid and debt relief for the world's poor if people who are held up to us as model humanitarians adopt a "do as I say, not as I do" attitude to paying taxes?

The Tax Justice Network has estimated that the amount of funds held by wealthy individuals in tax havens could generate a staggering \$255 billion dollars in additional tax revenue annually - enough to finance the UN's Millennium Development Goals. In other words, the poorest of the world's poor pay dearly for the inequities in the global taxation system and any award that even unwittingly hides that reality must be exposed. - Yours, etc,

RONAN TYNAN,
Blackrock,
Co Dublin.

Irish Rail and Transport 21

Madam, - In his defence of Transport 21, Barry Kenny of Iarnród Éireann (December 28th) claims that Sean Barrett shows a poor grasp of transport evaluation techniques. He goes on to claim that Iarnród Éireann has the strongest performance in delivering capital investment programmes on budget of all major recipients of Exchequer funding.

Surely the man cannot be serious. For instance, what transport evaluation techniques are being used in relation to the works at Tara Street station? Perhaps Barry Kenny could explain why it is taking so long - almost two years at this stage - to complete the refurbishment of one of the busiest stations in the

An Irishman's Diary

Cormac O'Raifeartaigh

"Bang" theory was to remain in the domain of speculative science.

Incredibly, the cosmic

testability.

American technology came to the rescue once more, with the advent of satellite telescopes that could deliver more accurate measurements of the cosmic background

radiation (free from interference from the earth's atmosphere). The first such experiment, the Cosmic Background Explorer (COBE) satellite, was launched on its own Nasa rocket in January 1989. Led by John Mather and George Smoot, the COBE mission comprised a team of more than 1,000 scientists and engineers, and provided stunning new measurements of the cosmic radiation that gave strong support for the Big Bang model. Most significantly, measurement of tiny variations in the temperature of the radiation gave a clear picture of the



Fr Georges Lemaître: first proposed the Big Bang model of the universe

background radiation was discovered serendipitously in 1964. Switching on a new, highly sophisticated radio telescope at the Bell Laboratories in New Jersey, American astronomers Arno Penzias and Robert Wilson recorded a mysterious background signal permeating all their measurements. Detailed analysis by theoreticians showed that the signal closely matched the predicted cosmic background radiation, and the lucky astronomers later received a Nobel Prize.

Physicists all over the world rushed to study this background radiation, as it offered a priceless glimpse of the early universe. Ironically, the data soon exposed serious shortcomings in the Big Bang, which eventually led to a modification of the theory known as "inflation". This proposes that the universe experienced an incredibly rapid accelerated expansion immediately after the bang, later slowing to the expansion observed today. From a theoretical viewpoint, inflation solved many Big Bang riddles beautifully; however, it posed significant new problems of

mechanism of galaxy formation in the early universe and provided the first tentative evidence for inflation theory. The results were hailed by cosmologist Steven Hawking as "the greatest discovery of the 20th century, if not of all time", and resulted in this year's Nobel Prize.

The COBE mission marked the beginning of a new era of precision cosmology. Subsequent satellite telescope missions have provided even more precise data that furnish further support for Big Bang theory. As ever, startling new puzzles have also emerged - not least the discovery that the expansion of the universe is accelerating once more. Another mystery is that all known matter constitutes only a tiny fraction of the matter of the universe.

Most intriguingly, the experimental support for inflation raises the prospect that a recent prediction of the theory may also be correct - that our universe may be only one among countless other universes.

● Dr Cormac O'Raifeartaigh lectures in physics at Waterford Institute of Technology.

Many scientists will remember 2006 as the year when "Big Bang" physics was officially recognised with a Nobel Prize. Earlier this John Mather of the NASA Goddard Space Flight Center and George Smoot of the University of California at Berkeley were awarded the prize in physics for their role in an experiment that provided stunning evidence for the Big Bang model of the origin of the universe.

The study of the universe, the oldest of the sciences, was revolutionised early in the 20th century when the American astronomer Edwin Hubble discovered that the universe was continually expanding. (He observed that faraway galaxies are rushing away from the earth at a speed proportional to their distance, a discovery known as Hubble's Law).

The expanding universe was a great shock to mainstream science and philosophy. However, the phenomenon matched the predictions of Einstein's general theory of relativity - the modern theory of gravity. Armed with Hubble's data and Einstein's theory, scientists began to consider the origins of the universe (or cosmos) in earnest. It is generally agreed that the Belgian priest and mathematician Georges Lemaître was the first to propose the famous Big Bang model - the theory that postulates that the entire universe (matter, space and time) exploded from a tiny, immensely dense and immensely hot fireball, expanding and cooling ever since.

Lemaître's model of the birth of the cosmos became well known, but few scientists took it seriously for many years. One reason was that there seemed no obvious way of testing the model experimentally. In fact, even the name "Big Bang" was coined in derision by the sceptical British astrophysicist Fred Hoyle.

An intriguing line of inquiry emerged in the 1940s, when the Russian physicist George Gamow and colleagues published calculations showing that if the Big Bang model was correct, background radiation left over from the bang might still be present in today's universe, like a cosmic fossil. However, no one knew how to search for this remnant radiation and it seemed "Big