

Variable speed of light research gets a boost

A review of
Faster Than the Speed of Light: The Story of a Scientific Speculation
by João Magueijo
William Heinemann,
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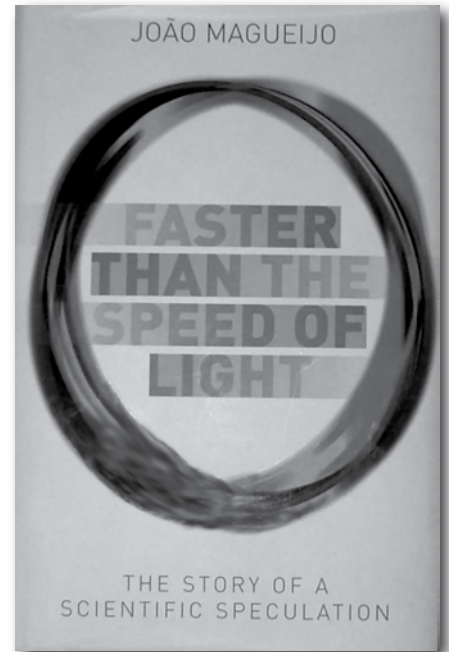
A number of secular papers have recently been published that shed light on the intriguing idea that the speed of light may have been markedly different in the past. This recent book by João Magueijo, *Faster than the Speed of Light*,¹ discusses the background to these papers and the reason why some very notable physicists, including the author himself, have been willing to consider the possibility of a variable speed of light (VSL). Creationists have also been interested in these ideas in the past, although at the present time the idea of VSL remains on the fringes of creationist thinking, with most seeming to favour instead Dr Russell Humphreys' White Hole Cosmology,² and new developments such as the Hartnett model.³ This book by Magueijo has also caused a great deal of controversy in the scientific world for promoting VSL ideas.

The author also caused controversy because he bitterly criticised the scientific establishment and the peer review process with very colourful and expressive language. Such vitriolic *personal* attacks and his occasional blasphemous humour are regrettable and offensive and they take away from the very important subject matter. However, that is not to say that Magueijo does not make valid criticisms of the way the scientific community hinders the search for truth,

as many creationist scientists would testify. There is also insufficient detail on the physics behind their work with details spelt out only as broad outlines, but instead plenty of page space is used up in insulting the scientific establishment.

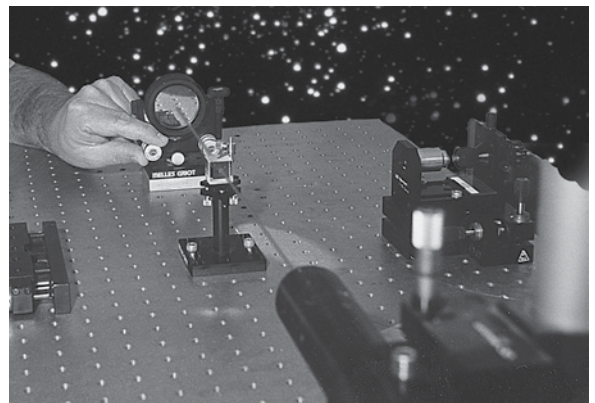
Magueijo is a leading physicist and lecturer at Imperial College London, having gained a Ph.D. at Cambridge, and was for a time a Royal Society research fellow. He gives credit to some of those working on the VSL subject with him, particularly fellow researcher Andreas Albrecht, a pioneer of inflation theory with whom he wrote a joint paper.⁴ The book really describes the background to their developing work, the problems they encountered and overcame, and later describes the work of other secular physicists who have also worked on similar concepts.

While still a student, Albrecht⁵ cooperated with others to rework Alan Guth's original theory of inflation.⁶ Inflation theory was devised as a rather artificial construction to account for the observed flatness and smoothness of space, by dealing with the horizon problem. There was also a need to find a way of including a repulsive force L (Lambda), while at the same time preventing this force from running out of control. A universe without L would quickly fall in on itself in a big crunch, but with L it expands so rapidly as to become virtually empty. However, the idea envisaged a rapidly inflating universe within the very first split second that would act with L until it was cool enough for matter to freeze out, at which point L would be turned off, allowing the universe to expand to its



present, apparently flat shape.

The problem of smoothness and flatness, or homogeneity in the big bang scenario, requires that energetic contact exist between different parts of the universe across the event horizon. A homogenous universe is one where the density is the same everywhere, but without such energetic contact the universe would be lumpy instead of smooth. If different parts of an expanding universe were not able to 'see' beyond the event horizon, then the shape and energy density of space would not be constant, and different parts would be hotter than others. Inflation theory appeared to



Some secular cosmologists working on the horizon problem have found that a better solution to account for the smoothness and flatness of space is that light speed may have been much faster in the past.

Photo by NASA/JPL-Caltech/R. Kennicutt (University of Arizona) and the SINGS Team



Light from distant galaxies such as NGC 4725 at 41 million light years in the constellation Coma Berenices, appears to take too long to arrive on Earth in a young universe. How can creationists reconcile such distances with a young earth? One possible solution is that light speed was much faster in the past. Picture taken by the Spitzer Space Telescope.

who is noted for his research into the variability of so-called physical ‘constants’, continues to research and publish VSL papers with Magueijo.

John Moffat also developed a VSL theory prior to Albrecht and Magueijo. Moffat had a VSL paper rejected by *Physical Review D*, and it was subsequently published in a minor journal.¹⁰ When he heard of the planned publication of VSL papers by Albrecht and Magueijo, and Barrow, he considered taking legal action to prevent publication, although the misunderstanding was settled with a citation given to Moffat’s work. Moffat had an unorthodox start to his scientific career and was largely self-taught. He gained a Ph.D. without ever being an undergraduate student, and his ability in physics was initially recognized by the likes of Einstein, Schrödinger and Bohr. Moffat’s VSL paper differed from Albrecht and Magueijo in that it attempted to develop a Lorentz Invariant VSL theory, partly out of regard for Einstein. At a basic level, Lorentz Invariance means that a physical concept works within the theory and postulates of general relativity,¹¹ and Moffat achieved this by proposing that the graviton may have a different ‘speed of light’ than a photon. Magueijo subsequently presented other VSL papers that were Lorentz Invariant. Magueijo also met Paul Davies while in Australia and John Webb, who encouraged him with evidence that the fine-structure constant, α , appears to be changing with time.¹² This tentative finding is dependent on the speed of light, although admittedly a changing electron charge would also cause it to vary. Similar ideas have also been discussed by Paul Davies in *Nature*¹³ and in *New Scientist* by John Barrow.¹⁴

Previous creationist interest in VSL research

As noted, this area has previously been of interest to creationists. Carl Wieland for instance has highlighted some of the creationist research into

offer a solution to this homogeneity problem.

However it would seem that Albrecht, who helped develop inflation theory to account for the horizon and homogeneous problem, had never really been happy with the theory and was more than willing to work on an alternative theory of VSL with Magueijo. Although inflation allows a homogeneous universe to develop, it does not in itself provide a mechanism for homogeneity to occur. A number of secular big-bang critics have been even more critical, calling the inflation theory ‘hypothetical’ and a ‘fudge factor’, pointing out:

‘Inflation requires a density 20 times larger than that implied by big bang nucleosynthesis, the theory’s explanation of the origin of the light elements.’⁷

Also, inflation lacks any demonstrable physical mechanism to start it or stop it once it begins, so it is doubtful if it even qualifies as a

scientific hypothesis.⁸

VSL offers an alternative to inflation theory to account for the observed flatness and smoothness of space by solving the horizon problem, and also provides a mechanism for homogeneity to occur. Magueijo worked through Einstein’s field equation for a perturbed universe, and found that it led to homogeneity. A decreasing speed of light requires a flat universe of critical density to maintain energy conservation. A closed model would require energy to be destroyed, while an open model would require energy to be created.

The paper that Albrecht and Magueijo submitted was eventually published after much haggling alongside a similar VSL paper by John Barrow.⁹ Barrow’s paper proposed that light had slowed down through the age of the universe, whereas the paper by Albrecht and Magueijo proposes slowing only at the very beginning, as a direct alternative to inflation. Barrow,

VSL (previously known as ‘c-decay’ or CDK for short) in *Journal of Creation*.¹⁵ Trevor Norman and Barry Setterfield¹⁶ were the first creationists to raise the possibility that light has slowed over the lifetime of the universe in a paper invited by physicist Lambert Dolphin of the Stanford Research Institute. Their research involved comparison of several hundred years of speed of light measurements, which appear to show that the speed of light slowed down relative to astronomical time over that period. This reduction in light speed seems to lie outside of statistical error bars and also shows a consistent lowering of speed,¹⁷ whereas statistical errors in measurement should lie both above and below a constant value. This gives a tantalising glimpse of possible speed of light changes in the past, but backward extrapolation from this data on its own, over longer periods of time is problematic, and other evidence is needed to support their findings. Troitskii¹⁸ also proposed in 1987 that light had been faster in the past.

The paper by Norman and Setterfield led to disagreement among creationist scientists, with Malcolm Bowden for instance defending CDK,¹⁹ while Evered²⁰ and Aardsma²¹ rejected it. Russell Humphreys’ White Hole Cosmology also offers an alternative relativistic varying time dimension as a means of harmonising cosmology with the Genesis account.²

Summary

This recent book by Magueijo gives a glimpse into some important theoretical research that may be of some interest to creationists. However, these are still early days for VSL and further research will be necessary to provide more evidence. In general, VSL may offer some intriguing mechanism for harmonizing a literal reading of the Genesis account with cosmology as an alternative to a relativistic approach. It

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may also be possible for creationists to develop VSL theories that work within the postulates of general relativity. A very important lesson is that the common *in principle* attacks against Setterfield *et al.*, e.g. ‘these pseudoscientists don’t realize that the speed of light is a constant’, are clearly unsound. If it’s OK to appeal to VSL to rescue the big bang, then it’s OK to do the same with Genesis as well!

Also, a currently mechanism-free inflation theory shows that creationists should not be faulted for postulating that God supernaturally ‘inflated’ the universe (cf. God ‘stretched out’ the heavens; Isaiah 42:5, 45:12, 51:13).

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