

for not accepting decay in  $c$ , which carried through to his later article. It was this. If the wavelength is not changing, then the frequency must be changing and consequently "the value of every atomic frequency must be changing (in unison with  $c$ ). . . Such a variation is most improbable. . .". However, from a conservation of energy approach as applied to the atom, what Birge as his natural reaction considered as most improbable turned out to be the only mathematically valid solution. The atom is affected by the change in  $c$  — higher  $c$  means faster motion of the atomic particles etc. This had been worked out mathematically even before the opportunity came to check these references. Thus your reasons for referencing Birge and Kennedy as being against  $c$  decay are invalid.

## MICHELSON'S C MEASUREMENTS AND THE C DECAY CURVE

Comments from Mr A. Sproul, Frenchs Forest, N.S.W., Australia.

Let me make it clear from the start that I don't believe in evolution, nor do I believe in creation science. I do however, firmly believe in a creative Being, which some of us call God, and that science is only really capable of explaining that which our physical nature can comprehend. The nature of God certainly can't be perceived by our physical being alone, and it is for these reasons I find I must object to Barry Setterfield's "treatise" on the decay of the speed of light.

Being in my fourth year of a physics degree, a friend, thinking I would be interested, lent me a copy of Barry Setterfield's article. Rather than finding some new physics within the pages of *Ex Nihilo* I found I was greatly disappointed by the argument put forward.

The article described how Setterfield using a curve-fitting computer program, found that the best fit to the 300 years or so of data of the velocity of light was **not**  $c$  equals a constant but a curve which decayed with time. This is fine for interpolation of data from between known data values. However, Setterfield extrapolated back in time along his decay curve to obtain some huge value for the speed of light 10,000 years ago. This was then used to "explain" how the Universe was really much younger than the "evolutionists" would have us believe.

I will not enter into the metaphysical argument, but merely point out that Setterfield's basic physical argument is utterly and totally wrong. There is absolutely no mathematical justification for extrapola-

tion in the best of circumstances, let alone extrapolating 10,000 years outside a known range of only 300 years of data!

Apart from this, in his update (*Ex Nihilo*, November 1983), Setterfield correctly quotes Michelson's decreasing measurement of  $c$  from 1879-1926 and the ensuing physical debate. What he fails to mention is that Michelson's 1932 measurement with the same method, gave a value

$$c = 299,774 \pm 11 \text{ km/sec}$$

which is below the constant value

$$c = 299,792 \text{ km/sec}$$

which Setterfield agrees is the current **non**-decaying value today.

If this was only a distortion of science it would be bad enough but to mislead non-scientifically trained people concerning God and the nature of His creation with incorrect, pseudo-scientific arguments is far worse.

## Barry Setterfield replies. . .

Allow me to take your final point first. You mention that I have quoted Michelson's values from 1879-1926 which show that  $c$  was decaying during that period, but that I fail to mention Michelson's 1932 measurement which was below the present value of  $c$ . It is rather unfortunate for those following this debate in Australia that there was an American edition of *Ex Nihilo* put out from Australia in which all these values were totally presented and discussed. You apparently have not had the benefit of viewing that document, which also appears in my current research monograph and is about to be updated. Yes! Michelson, or rather Pease and Pearson, did obtain a value of 299,774 km/sec and this appears in the list of figures on p. 13 of the monograph and is discussed, along with the other "low" values, on p. 20. This result has been the subject of much criticism and a reason for the anomalously low value is apparent. The experiments were conducted along a light path in a 1 mile long evacuated tube with plane mirror reflections giving a total light path of 10 miles. There was one unfortunate aspect of the situation in that the "base line was on very unstable alluvial soil" near Laguna Beach, California. There was an admitted "correlation between fluctuations in the results and tides on the sea coast. . ." which was causing fluctuations in the base length and the measurements made of it. Indeed those base-line measurements were all made during the day while measurements on the rotating mirror were done at

night when the speed of light experiments were conducted. Cohen et al in **The Fundamental Constants of Physics**, p. 108 are almost certainly correct in their assessment (as others are) in tracing this as the cause of the anomalously low results. The other anomalously low values, as you will be aware, were due to the systematic error in the Kerr Cell, yet even here the drop in  $c$  is recorded, but shifted into a lower range.

I now come to your main point. You state that my basic physical argument is “utterly and totally wrong”...with “absolutely no mathematical justification for extrapolation. . .of 10,000 years outside a known range of only 300 years of data”. In this you are completely mislead: there is no extrapolation involved whatever as there are data points at BOTH ENDS OF THE CURVE. You would be correct if there were only the  $c$  data to go on. That data set covers a period of about 300 years. IF there was an extrapolation by the factor of 20 that you mention, then that is modest in comparison with, say, the present half-life of U-238 of 4.5 billion years which has been determined on the basis of a few DAYS of counting and at most a period of 70 years of observations. This is an extrapolation by a factor of over 60 million, yet few worry about the conclusions reached on that basis.

However, to come back to the main point. The values of  $c$  form one set of data. There is a second set of data that must also be approximated to. From the ordinary laws of physics, including the conservation laws, it can be shown that the rate of radioactive decay is proportional to the speed of light (when  $c$  is higher, the decay rate is proportionally faster). It follows then that the natural abundances and isotopic ratios of the radioactive elements thus form a second data set. In addition, from the Doppler-Michelson equation, it becomes apparent that a change in  $c$  will produce a red-shift in the light that has decayed in speed during its travel time. Consequently, the red-shifting of light from distant galaxies also forms a data set. In this case the numerical value of the ratio  $N/T$  is defined. For example, the Virgo Cluster of galaxies gives  $N/T = 0.001$  for a point along any proposed curve that approximates to a 60 million LY integral. Here  $N = c(\text{then})/c(\text{now})$  and  $T$  is total time since emission. The limiting value is  $N = T$  approximately for a total integral range from 1.8 billion LY to 5.6 billion LY. The upper value of  $c$ , and hence  $T$  also along the x-axis, are defined within close limits by this procedure and turn out to be roughly  $2 \times 10^{11}$  faster than  $c$  now and total time since decay approximates to  $2 \times 10^{11}$  seconds, or something less than 10,000 years. You will find the details in the article on the red-shift also in this volume.

Under these circumstances, with points defining

the upper part of the curve from observed physical quantities and the end part of the curve from the  $c$  data, it becomes apparent that the statement made about extrapolation is totally without validity. Accordingly, I suggest that you might like to re-consider the logical consequences of the theory which, instead of being based on a “pseudo-scientific argument”, rest on a solid base of observational fact.