Fleeing from catastrophe

A third problem for the uniformitarian scenario is that the individual trackways shown in the article are generally straight, a pattern similar to other trackway sites.[13] Furthermore, all the trackways in the Sundance Formation in the vicinity of Shell are primarily directed towards the south to southwest.[14] The trackway directions in the Gypsum Springs Formation are not given, probably because they are of poor quality. This is unusual behavior for such a large group of dinosaurs. Normal behavior should include many meandering tracks. The large number of orientated trackways indicate that the animals were fleeing from catastrophe.[15,16]

A fourth quandary for uniformitarian scientists is that there are no baby or young juvenile tracks. A normal assemblage of tracks should include abundant baby or young juvenile tracks, for instance 50% of the elephant tracks from Amboseli National Park, Africa, were made by juveniles.[17] This rarity of immature dinosaur tracks indicates that the tracks were made during unusual conditions and is against the uniformitarian principle. In the Flood model, babies and young juveniles would be left behind while those able to flee the encroaching Flood waters ran away. (It is expected that babies would be found within or close to egg laying sites on the exposed land, which seems to be the case, for instance Egg Mountain and other areas of north central Montana.[18,19])

The characteristics of the new Wyoming megatracksites are perplexing within the uniformitarian paradigm. However, the tracks are easily explained by a Flood model of temporarily exposed land or a series of shoals during the Inundatory Stage of the Genesis Flood.

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Speed of light slowing down after all? Famous physicist makes headlines

Carl Wieland

Headlines in several newspapers around the world have publicized a paper in *Nature* by a team of scientists (including the famous physicist Paul Davies) who (according to these reports) claim that 'light has been slowing down since the creation of the universe'.[1]

In view of the potential significance of the whole 'light slowing down' issue to creationists, it is worth reviewing it briefly here.

Well over a decade ago, *Creation* magazine published very supportive articles concerning a theory by South Australian creationist Barry Setterfield, that the speed of light ('*c*') had slowed down or 'decayed' progressively since creation.

In one fell swoop, this theory, called '*c* decay'[2] (CDK) had the potential to supply two profound answers vitally important for a Biblical worldview.

The distant starlight problem

One was, if stars are really well over 6,000 light years away, how could light have had time to travel from them to Earth? Two logically possible answers have serious problems:

1. God created the starlight on its way: this suffers grievously from the fact that starlight also carries information about distant cosmic events. The created-in-transit theory means that the information would be 'phony', recording events which never happened, hence deceptive.
2. The distances are deceptive: but despite some anomalies in redshift/distance correlations,[3] it's just not possible for all stars and

galaxies to be within a 6,000-light-year radius—we would all fry!

But if light were billions of times faster at the beginning, and slowed down in transit, there would be no problem.

Radiometric dates

Since most nuclear processes are mathematically related to the speed of light, a faster '*c*' might well mean a faster rate of radioactive decay, thus explaining much of the evidence used to justify the billions of years of geological hypothesizing. In fact, top-flight creationist researchers involved with the RATE (**R**adioactive Isotopes and the **A**ge of **t**he **E**arth) project have found powerful evidence of speeded-up decay in the past.[4] CDK might offer a mechanism.

CDK—the history of the idea

Barry Setterfield collated data of measurements of *c* spanning a period of about 300 years. He claimed that rather than fluctuating around both sides of the present value as measurements became more accurate, they had progressively declined from a point significantly higher than today's value. He proposed that this decline had been exponential in nature, i.e. very rapid early on, gradually easing to stabilize at today's value for *c*, just a few decades ago.[5]

He and Trevor Norman, a mathematician from Flinders University in South Australia, published a monograph[6] (still stocked by this ministry for the assistance of potential researchers) outlining this, and answering several arguments raised against the theory. The monograph also showed how, over the past years, the measurements of the value of various constants (e.g. electron mass, Planck's constant (h)) were varying progressively, if ever so slightly, in a 'directional' fashion consistent with the direction predicted by their mathematical linkage with '*c*'.

With such a bombshell, there were, not surprisingly, substantial efforts at scientific assessment and criticism. The critiques were not only from those motivated to undermine Biblical cosmology, but from leading creationist physicists. Criticism ('iron sharpening iron' as Proverbs 27:17 puts it) is meant to be a healthy process enhancing the search for truth in science.

The criticisms centred around two issues: the first was the validity of the statistical data itself, particularly the reliability of some of the earlier measurements of *c* given their large uncertainties, and the other was the consequences we should find in the present world if *c* has declined. This is an immensely complex area; for one thing, when *c* changes, so do other things, which can become mind-boggling to sort out, even for the experts.

One of the attacks concerned Einstein's special relativity, $E = mc^2$ and the like. (If *c* is a billion times greater in the past, then E would be a billion billion times greater, so would not a campfire be like an atom bomb, and so on?) Critics at the time used this to mock CDK, but Setterfield answered that rest mass itself is **inversely** proportional to c^2, so that energy is still conserved. He also claimed that there is experimental evidence that the charge to mass ratio of an electron has been decreasing (supporting his claim that mass has increased as c^2 has decreased).

But as usual, the skeptics, along with 'progressive creationist' (long-age) astronomer and ardent big bang advocate, Dr Hugh Ross,[7] kept repeating this claim as if Setterfield hadn't thought of this and answered it. Whether one agrees with his answer or not, it was improper to ignore it (or perhaps his critics, lacking any qualifications in physics, didn't understand it).

Critics of CDK said that accepting it would mean one would have to discard Einstein, despite all the evidence for his theory. Setterfield said (and it seems to me correctly) that all that special relativity claims in this matter is that *c* is constant *at any point in time with respect to the observer*, it does not involve any magic, canonical value for *c*. In other words, the actual value of *c* could change with time, so long as that change was consistent throughout the entire universe.[8]

Others dismissed CDK by claiming that if *c* had changed, the *fine-structure constant* (FSC, symbol α) should be different as measured using light from distant stars than from those nearby, but that this was not so.[6] However, Setterfield's particular theory predicted that the FSC would remain *constant*.[9]

A word of caution

But, intriguingly, it now turns out that the fine-structure constant is in fact slightly different in light from distant stars compared to nearby ones. In fact, this is *the very reason* that physicists of the stature of Davies are now prepared to challenge the assumption that light speed has always been constant. And in addition to being different from the prediction of the Setterfield theory, this research by itself does not support *c*-decay theory of the magnitude that Setterfield proposed. The change is billions of times too small. In fact, the newspaper hype surrounding Davies' theory, and the quotes attributed to him, hardly seem to be justified by the *Nature* article itself, which is rather speculative. Note that, although Setterfield predicted constant α, given the small change and tentative nature of this new discovery, by itself it is not conclusive evidence against the Setterfield theory either. (See an earlier response to reports of a change in α.[10])

Unfortunately, despite being urged to continue to answer critics and further develop his theory within the refereed technical creationist literature, Setterfield effectively withdrew from that forum some years ago, though not from individual promotion and development of the idea, e.g. on the Web.[11]

Well known creationist physicist, Dr Russell Humphreys (now with ICR), has long given credit to Setterfield's challenging hypothesis for stimulating the development of his own cosmology, which seeks to answer the same question about star-

light, and which is currently in favour among many creationist astronomers.[12] Humphreys says that he tried for over a year to find a way to get CDK to 'work' mathematically, but gave up when it seemed to him that so many things were changing in concert that it would be hard to detect a change in *c* from observations.

It's also important to note, as we have often warned, that newspaper reports are often very different from the original paper. The actual *Nature* article, as shown by its accurate title, was about how the theory of black-hole thermodynamics *might* determine which is correct out of two possible explanations for *previous* work that claimed that FSC might have increased slightly and slowly over billions of years. The details are summarized in the box. In conclusion, the authors (who are also prepared to accept that their interpretation of the data may be wrong) still believe in billions of years, and would reject the relatively rapid change in *c* that Setterfield proposed since they are talking about <0.001% over 6–10 billion years.

To be fair to the journalists, Davies has long been something of a publicity seeker. So he possibly didn't mind at all that his actually quite non-descript paper was being publicized (it was less than a full page in total length in the 'Brief Communications' section, and didn't rate a mention as a feature item), even for something peripheral to the paper.

Other *c*-decay ideas

Still, it is fascinating to see vindication for at least the possibility that *c* has changed. Whether this decline (if real) has only just ceased recently, as Setterfield proposed, or happened earlier (perhaps in a 'one-step' fashion), or is still going on, is another question.

Physicist Keith Wanser, a young-universe creationist and full Professor of Physics at California State University, Fullerton, told *Creation* magazine in 1999 that he was open to the idea of changing *c*.[13] He said:

> 'I don't go along with Barry's statements on this; he's well-meaning but in my opinion he's made a lot of rash assumptions ... and there's a misunderstanding [of many of the consequences of changing *c*].'

But Wanser (who is also a member of the RATE group sponsored by ICR/CRS, and is set to speak at AiG-USA's major science conference in May 2003), also said:

> 'there are other reasons to believe that the speed of light is changing, or has changed in the past, that have nothing to do with the Setterfield theory.'

Note that the RATE group is not, as has been suggested publicly since the Davies publicity, intrinsically opposed to the notion of changing *c* but is open to the idea of changing radioactive decay rates from whatever mechanism might turn out to be viable.

The interview also quoted a 1999 *New Scientist* cover story two years ago, which also proposed the 'heresy' of *c*-decay.[14] (More recent *New Scientist* articles have reported on how it seems to be acceptable to propose *c*-decay to try to solve another well-known difficulty of the big bang theory, called the *horizon problem*. That is, the cosmic microwave radiation indicates that space is the same temperature everywhere, indicating a common influence. But no connection between distant regions would be possible, even in the assumed time since the alleged big bang, because of the 'horizon' of the finite speed of light. As an *ad hoc* solution to this problem, Alan Guth proposed that the universe once underwent a period of very rapid growth, called 'inflation'. But now it seems that even this has its own horizon problem. So now some physicists have proposed that the speed of light was much faster in the past, which would allow the 'horizon' to be much

What was Davies' paper *really* about?

The gist of it is:

1. Already known: the fine structure constant $\alpha = 2\pi e^2/hc$, where e is the electronic charge and h is Planck's Constant. Last year, there was a claim that α is increasing over time.[19]
2. So this increase in α could be due to increasing e or decreasing *c* (CDK). But as mentioned, this conflicts with Setterfield's model that has α *invariant* with varying *c* because it's h that varies inversely to *c*.
3. The Second Law of Thermodynamics is in force. The entropy of a black hole increases with area of its event horizon (that's if the standard formula applies with either varying *c* or e). Therefore the area cannot decrease unless the black hole's environment has a corresponding entropy increase.
4. The key point of this *theoretical* 'brief communication': an increase in e would mean a reduction of a black hole's area, which would seem to violate the Second Law under the current formula. Increasing e could also lead to an increase of a black hole's electric charge above a threshold value where the event horizon disappears and we are left with a *naked singularity*, and this would violate what's known as the *cosmic censorship hypothesis*. Davies *et al.* conclude:
   'Our arguments, although only suggestive, indicate that theories in which e increases with time are at risk of violating both the second law and the cosmic censorship hypothesis.'
5. But a decrease in *c* over time would lead to an increase in a black hole's area, which is in line with the Second Law. So by a process of elimination based on this theory about black hole thermodynamics (*not* on any new data), a *tiny* decrease of *c* is the right explanation for the *tiny* increase that was previously claimed for α over time.

further away and thus accommodate the universe's thermal equilibrium.[15] Note that these other proposals even have *c* much faster than in the Setterfield concept.)

Whether Setterfield is truly vindicated, in whole or in part, remains to be seen; the process of resolving these things would be greatly helped by further scientific debate of the actual issues in *TJ* or the *CRSQ*.

The irony of bias

It is truly ironic to look back at the time when CDK was being actively put forward by many creationists as a profoundly important hypothesis. The anticreationists, both the anti-theists and their compromising churchian allies, launched their attacks with glee. Skeptics around the world seldom failed to have audiences in fits of laughter at the 'ridiculous' notion that what they labeled as a 'certain cornerstone of modern physics', the alleged constancy through time of the value of *c*, was wrong.

No matter what comes of his notion as a whole, no matter even whether *c* has actually changed or not, in that sense at least, thanks to Paul Davies, Setterfield (and those, like ourselves, who supported his pioneering efforts) has already had the last laugh.

The real issue

Christians worried about the 'starlight travel-time' issue have seen a number of theories put forward to try to solve it, including CDK. For instance, the relativistic white-hole cosmology of Humphreys and even the two different conventions of calculated vs observed time.[16] Which of these is right? Maybe none.

I believe we need to understand, as most physicists really do, how immensely little is yet known about such major issues. What if Humphreys is right, for instance, and the answer lies in the general relativistic distortion (by gravity) of time itself in an expanded (by God who 'stretched out the heavens' as Scripture says repeatedly) bounded universe? Would not the world have laughed if such notions (as time running differently under different gravity influences, for instance) had first been put forward by modern Bible-believers? They would have been seen as *ad hoc* inventions, but they have been experimentally tested.

This 'secular CDK' announcement, by one of the biggest names in physics, should really be an antidote to the confident arrogance of long-age big-bangers. So should the recent landmark *TJ* paper by Humphreys showing observationally that we are in fact close to the centre of a bounded universe.[17]

People need to be aware just how abstract, shaky and prone to revision the findings of modern cosmology really are. To quote Prof. Wanser again:

> 'The sad thing is that the public is so overawed by these things [big bang and long-age cosmologies], just because there is complex maths involved. They don't realize how much philosophical speculation and imagination is injected along with the maths—these are really stories that are made up.'[18]

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