

Re: Time without end: Physics and Biology in an Open Universe

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From: Maurice Barnhill (*mhb_at_udel.edu*)

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Michael Ragland wrote:

- >
- > *Michael Ragland wrote:*
- > *P.S. I thought I was alone in my belief intelligent life could modify*
- > *the physical laws of the universe for its own purposes. Many may*
- > *strongly disagree with Freeman Dyson but I don't think anybody would*
- > *justifiably consider him a crackpot.*
- >
- > *Maurice Barnhill again:*
- > *Dyson states that he will discuss what life*
- > *could do to use or ameliorate the effects of the expansion of the*
- > *universe within the known laws of nature. As far as I can see he does*
- > *just that.*
- > *He never uses an equation that is changed from those we*
- > *derive from observation.*
- >
- > *Michael Ragland:*
- > *That is correct so I'm mistaken in my statement*
- > *intelligent life could modify the physical laws of the universe for its*
- > *own purposes (at this time). I equated it with life and intelligence can*
- > *succeed in molding this universe of our to their own purposes. Obviously*
- > *no one in the physics community would have even mildly entertained*
- > *Dyson's thesis if it were not based on human equations derived from*
- > *observation. And this should be the case and is. Here lies the strength*
- > *of Dyson's argument and alas also where the weakness lies.*
- >
- > *As he states, "Weinberg has here, perhaps unintentionally, identified a*
- > *real problem. It is impossible to calculate in detail the long-range*
- > *future of the universe without including the effects of life and*
- > *intelligence. It is impossible to calculate the capabilities of life and*
- > *intelligence without touching, at least peripherally, philosophical*
- > *questions. If we are to examine how intelligent life may be able to*
- > *guide the physical development of the universe for its own purposes, we*
- > *cannot altogether avoid considering what the values and purposes of*
- > *intelligent life may be. He states, "I shall make no further apology for*

- > *mixing philosophical speculations with mathematical equations."*
- >
- > *Dyson acknowledges, "In conclusion, I would like to emphasize that I*
- > *have not given any definitive proof of my statement that communication*
- > *of an infinite quantity of information at a finite cost in energy is*
- > *possible. To give a definitive proof, I would have to design in detail a*
- > *transmitter and a receiver and demonstrate that they can do what I*
- > *claim. I have not even tried to design the hardware for my*
- > *communications system. All I have done is to show that a system*
- > *performing according to my specifications is not in obvious*
- > *contradiction with the known laws of physics and information theory."*
- >
- > *He states, "The universe that I have explored in a preliminary way in*
- > *these lectures is very different from the universe which Steven Weinberg*
- > *had in mind when he said, "The more the universe seems comprehensible,*
- > *the more it also seems pointless." I have found a universe growing*
- > *without limit in richness and complexity, a universe of life surviving*
- > *forever and making itself known to its neighbors across unimaginable*
- > *gulfs of space and time. Is Weinberg's universe or mine closer to the*
- > *truth? One day, before long, we should know.*
- > *Whether the details of my calculations turn out to be correct or not, I*
- > *think I have shown that there are good scientific reasons for taking*
- > *seriously the possibility that life and intelligence can succeed in*
- > *molding this universe of ours to their own purposes."*
- >
- > *You write, "Dyson states that he will discuss what life could do to use*
- > *or ameliorate the effects of the expansion of the universe within the*
- > *known laws of nature. As far as I can see he does just that." I could be*
- > *wrong (as I obviously was in misinterpreting Dyson) but it is my*
- > *understanding recent equations point to an ever expanding universe yet*
- > *many physicists believe the universe will ultimately collapse or go into*
- > *the "Big Crunch" and that entropy will increase and the arrow of time*
- > *will not reverse itself.*

If our understanding of the laws is correct, the universe recollapses if it has enough mass and expands forever otherwise.

If there is a so-called cosmological constant or a type of matter that is functionally equivalent to a cosmological constant the expansion of the universe can actually accelerate. So our prediction of whether it is infinite in time depends on measurement of the density of matter in the universe and the cosmological constant. At the present time the density of matter appears to be small enough that the universe should expand forever, and the cosmological constant seems to be nonzero so the expansion seems to be accelerating.

- >*If true, how could intelligent life "mould the*
- >*universe to its purposes" without at least supplementing and modifying*
- >*our current physical laws or equations based on observation?*
- >

If a very powerful civilization found that the universe will collapse, it might try to move matter around in such a way as to preserve at least a local region that would not collapse. That effort would not necessarily involve changing the laws.

- > Dyson states, "I have found a universe growing without limit in richness
- > and complexity, a universe of life surviving forever and making itself
- > known to its neighbors across unimaginable gulfs of space and time. Is
- > Weinberg's universe or mine closer to the truth? One day, before long,
- > we should know.
- >
- > This "appears" to be reflective of an ever expanding infinite universe.
- > Dyson states, "These conclusions are valid in an open cosmology. It is
- > interesting to examine the very different situation that exists in a
- > closed cosmology. If life tries to survive for an infinite subjective
- > time in a closed cosmology, speeding up its metabolism as the universe
- > contracts and the background radiation temperature rises, the relations
- > (56) and (59) still hold, but physical time t has only a finite duration
- > (5). He later states, " I return with a feeling of relief to the wide
- > open spaces of the open universe. I do not need to emphasize the partial
- > and preliminary character of the conclusions that I have presented in
- > this lecture. I have only delineated in the crudest fashion a few of the
- > physical problems that life must encounter in its effort to survive in a
- > cold universe.
- >
- > So it "appears" he doesn't subscribe to the collapsed universe theory or
- > closed cosmology. I've been trying to find out on the internet whether
- > the universe is truly a closed or open system.

I agree, although he seems to consider this as much a hope as a conviction.

- >Perhaps the question
- > itself is flawed. My understanding is that Hawking thinks the universe
- > is a closed system but with no boundaries or edges. I try to
- > conceptualize that. What does it mean to have no boundaries or edges?
- > According to entropy or the Second Law of Thermodynamics the universe is
- > a closed system which must increase in entropy.
- >

In an infinite universe it is problematic to say the least to apply the Second Law to the universe as a whole. That doesn't prevent applying it to nearly isolated systems within the universe.

- > Dyson's assumption of infinite life in the universe seems to be based on
- > an ever expanding and infinite universe. Doesn't this oppose increased
- > entropy of the universe in the "Big Crunch" assuming that takes place?
- > If I have misread Dyson again and his philosophical speculations and
- > mathematical equations suggest the possibility of life in a collapsed
- > universe then it is very apparent to me one has to have an understanding
- > of physics equations.

>

I think that Dyson is avoiding the discussion of any collapsing universe.

> *The basis for my statement of modifying the physical laws of the universe was based on three things primarily, two of which are not scientific at this time. I suppose that would be an oxymoron. First, human knowledge of the physical laws of the universe is limited. Second, given the billions of years the universe will be expanding and the possibility there is already extremely advanced extraterrestrial life in the universe it is not farfetched in my view such extraterrestrial life could advance its understandings of the physical nature of the universe where it could modify certain aspects of it.*

I don't see any sign of this but obviously you can't eliminate the possibility in principle. I suspect, however, that if this happened the life would no longer call the changeable part a law and would conclude that they were mistaken to consider it as law originally.

>*Third, if the universe is entropic and follows the law of the Second Law of Thermodynamics and the universe ultimately does recollapse certain extraterrestrial life forms could have the knowledge, science and technology to mitigate against its effects.*
>

You have an large amount of time to move things around. That might be enough. You also might fail, and there is no way to tell what would happen given a much more advanced civilization.

> *Non of this is obviously scientific and since you are a scientist I doubt you have much use for it. But I really don't believe in an open infinite expanding universe with the universe not recollapsing eventually (if that is what Dyson believes) And many physicists seem to think intelligent life will be extinguished in such an event. My argument for infinite life in the universe isn't based on an ever expanding open universe which gels with our observations or at least doesn't contradict them as Dyson puts forth. My argument for infinite life in the universe is based on my belief the universe will ultimately collapse and increase in entropy and that in the billions and billions of years before this occurs certain extraterrestrial life forms will have scientifically and technologically in accordance with their values and purposes (which may well be continued self survival if the universe recollapses) to have the theoretical possibility of having much more physical knowledge of the universe and being able to circumvent the recollapse of the universe by modifying physical laws of the universe. Who is to say that right now there isn't some advanced extraterrestrial life form in the universe who is aware the universe will eventually recollapse and isn't working on "scientific projects" to contain it,*

- > *limit it, mitigate against it, insulate from it, etc. Are we so arrogant*
- > *that we can project what extraterrestrial life as well as our own will*
- > *be like billions of years from now?*
- >
- > *Anyway, since you are a physicist I have a few questions. You are not*
- > *obligated to answer but I am curious.*
- >
- > *(a) What is meant by "multiple universes". "anti universes", etc. Are*
- > *they all a part of the same universe and if they are how. If there is a*
- > *collapse of the universe will these multiple universes and*
- > *anti-universes be equally effected.*
- >

I think that there are at least two meanings of multiple universes, and I don't understand all the possibilities. One, however, is that we are inside an expanding bubble of space-time which is only part of the complete universe. There could be other bubbles that we will never be connected to, and the "constants" of physics might even be different in the other bubbles. In passing, it is pretty obvious that this idea can easily fall prey to Occam's Razor.

- > *(b) If there was a "Big Bang" singularity which created the universe why*
- > *couldn't there theoretically be other "Big Bangs" which create other*
- > *universes.*

There could be. See (a).

- >
- > *(c) The human mind has a tendency to think of a beginning and an end.*
- > *Infinity is a hard concept to grasp but can be demonstrated*
- > *theoretically in the sense of numbers 1-infinity. But before the "Big*
- > *Bang" which lasted mere seconds there was "nothing"? Even zero stands*
- > *for something..a symbol. What existed before the "Big Bang" or the*
- > *materials which made up the "Big Bang". Infinity is a hard concept but*
- > *"nothing" is even harder.*
- >

Time begins with the Big Bang. Therefore there is no before for anything to exist in. This is a concept to get reconciled to, not to understand I'm afraid.

- > *(d) Is it true we don't know what over 90% of the universe is made out*
- > *of?*

Sure is. There are guesses and speculations but no data, except that whatever the 90% is participates in gravity but not electromagnetism. Whether it participates in the weak interactions is not known, and much of it may have rather strange gravitational effects (accelerating the expansion of the universe for example).

>
> *Michael Ragland*
>
> *"It's uncertain whether intelligence has any long term survival value.*
> *Bacteria do quite well without it."*
>
> *Stephen Hawking*
>
>
>

We are dangerously close to the off–topic line, and I am not sure on which side. I guess we should think of this as determining the conditions that extremely persistent life would have to evolve under. Dyson's article is certainly very interesting in that regard.

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