Re: Do you believe?

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Rather against my better judgment, I'm going to answer these, mostly because I really want to. :)

I'll try to remain objective.

Jack Kotze wrote:
> 1. that we're alone in the universe?

Obviously it's hard to say, but my gut feeling is no, even if by "we" you mean a purportedly intelligent species. The way I arrive at this answer is as follows:

It seems to me that whether intelligence arises in one system is more or less independent of whether it happens in another. A priori−−that is, before knowing what kind of star system is in play−−it's reasonable to assign some (thus far unknown) probability p that intelligent life arises at some point in that system.

In that case, the probability that intelligent life never arises in a given system is estimated as 1−p; that it never arises in either of two systems is (1−p)^2; that it never arises in any of N systems is given by (1−p)^N; and so forth. That means that the probability that it arises at least once in N systems is 1−(1−p)^N.

I suspect that p is pretty small, so that 1−p is close to 1, and for some N, even (1−p)^N is close to 1. This seems supported by Fermi's Paradox−−that we cannot detect evidence of another civilization, even one like our own.

But clearly p is not zero, else we wouldn't be here. What we want to know is: What is the probability that intelligent life has arisen *more than once*, given that it has arisen at least once (that's us)? Or, alternatively, the pessimistic version: What is the probability that it has arisen *only once*, given that it has arisen at least once?

Let's take a look at that latter one. It is very close to 1 (that is, it is virtually certain that we are alone) if p is small compared to 1/N (where N is the number of systems in the universe). In these cases, almost no universes have intelligent life, and in most of the few that

do, it arises just once. Only very rarely does it happen more than once.

On the other hand, it is close to 0 (that is, it is equally certain that we are not alone) if p is large compared to 1/N. It does not have to be very large compared with 1/N. If it's 1/N, the probability of being alone is about 1/e (about 37 percent). If it's 2/N, that probability drops to about 27 percent. By 10/N, it's about a twentieth of a percent−−very unlikely that we're alone at that point.

Now here's where it becomes a bit of a matter of faith. I have this feeling that for certain parameters of the universe, where we just don't know what value they can take on, it's reasonable to say that it's just as likely that they'll be between 1 and 0.1, as between 0.1 and 0.01, as between 0.01 and 0.001, and so on. In terms of our current question, the probability that p is between 1/10N and 1/N is the same as that it's between 1/N and 10/N, or between 10/N and 100/N, and so on.

I think that it's very unlikely that p lies much below 1/10N, and in any case, the proportion of times that we are even around to ask this question when p is that low is small enough to be negligible. That means that it's not even that likely p is below 1/N, the point at which being alone becomes unlikely.

But N is very large, so 1/N is very small, and there are plenty of intervals above 1/N where p could lie. It could be close to (say) a tenth of a percent and there could still be reasons why we haven't heard from anyone yet. Maybe intelligent life just doesn't hang around very long, for reasons we don't totally apprehend yet.

That's one thing−−I've totally abstracted away the idea of the lifetime of a civilization. I've answered the question as alone in space *and time*. And also there's a lot of thinking with my gut here, which a scientist really should avoid. But I don't see any good way of answering it without involving the gut a little.

> 2. in evolution?

Do I believe that evolution has occurred? Yeah, the fossil evidence seems pretty indisputable. What is referred to as the theory of evolution is more properly called the theory of natural selection−−that evolution occurs as the result of genetic changes that arise randomly but are selected by competition for limited results on the basis of fitness for a certain niche. That mutations happen as a result of random copying errors, cosmic ray bombardment, carbon−14 decay, and other causes is not in doubt, and given billions of years (see the next question), there is plenty of time to account for the genetic difference between archaebacteria and us.

> 3. that the earth is a few billion years old?

Almost certainly. This has been verified in a few different ways. For instance, the behavior of the Sun fits stellar theory very well, and according to that theory, the Sun is about four to five billion years along in age. It seems reasonable to assume that the Earth formed around the same time.

Then, too, radiological evidence points to the same age. Older rocks are relatively richer in some lead isotopes and relatively poorer in others (lead−204, I think) as a result of uranium decay, which happens at a predictable rate. Some rocks exhibit such a significant relative imbalance in lead isotopes that they must be over four billion years old. Until recently, none of those were found on the Earth, but then, the Earth is geologically active. Very few rocks have been unmixed since that early in the Earth's history. But some meteorites have turned up that are radio−dated to that age.

It is *possible*, as some have suggested, that there is something wrong with radio−dating. Perhaps, the rate at which uranium decays into lead has changed over time. There's no evidence against that other than the sheer consistency of dating mechanisms−−but there's no evidence for it, either, and it seems imprudent to assume variability in a process that looks utterly uniform across all uranium samples, just to salvage the notion of a younger Earth.

> 4. that Dinosaurs became extinct 65 million years ago?

Yes. Again, there is agreement between different dating mechanisms: geological clocks (stratification and tectonic plate movement) and radio−dating techniques, at least. It's *possible* that plate movement has slowed down that drastically over time, and that radio−dating is just that plain wrong, and that biological clocks are wrong and things have evolved this far in just a few thousand years. It's just darned unlikely, that's all.

> 5. that the great flood really happened?

There seems quite a bit of evidence for a sizable flood in the Fertile Crescent area thousands of years ago. (I think it was the Fertile Crescent, anyway.) It must have affected a large proportion of the human population and given rise to any number of stories about a flood that have since been distorted to varying degrees.

> 6. that there is God who created heaven and earth?

No, but then I've previously explained that this is just me: I don't think I am capable of (rationally) believing this. Of course, an omnipotent being could compel me to believe (by brainwashing or something like that), but I don't think that's what you're asking about. I don't think any scientific evidence such a being could provide would lead me to believe in its existence. I'm just too

fallible a sentient being myself.

Note that this means that I think, hypothetically, that it's possible for such a being to exist−−I am just incapable of believing it.

> 7. everything scientists say?

That would be foolhardy. But then, it has never been a tenet of science that it is infallible. That's a straw man and as such it is easily defeated. Of course, individual scientists may insist on this or that, but that proves nothing except that scientists are human and can behave irrationally. On the whole, as a discipline, science must and does admit its own fallibility. Otherwise, if scientific absolutes were possible, progress in those fields would become impossible.

> 8. in the big bang theory?

There seems ample evidence for this. It explains the galactic red shift, the time scales are just about right for the stars we see at the ages we see them, it is consistent with galactic evolution as seen at varying distances, and so forth. Anyone is free to dispute it, of course, but they do so in opposition to a good deal of evidence (which they probably aren't aware of anyway).

> 9. that humans landed on the moon?

The alternative is too ludicrous to deserve comment.

> 10. that perhaps Mars was the first earth (Revelations)?

I have no idea what this even means. Where in Revelations is Mars even mentioned?

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- ***Follow−Ups***:
  - ♦ ***Re: Do you believe?***
    - ◊ *From:* Longfellow

- ***References***:
  - ♦ ***Do you believe?***
    - ◊ *From:* Jack Kotze

- Prev by Date: ***Re: Do you believe?***
- Next by Date: ***Pave the way for eyepiece discs?***
- Previous by thread: ***Re: Do you believe?***
- Next by thread: ***Re: Do you believe?***
- Index(es):
    - ***Date***
    - ***Thread***