

Galmol and Creation

(Cosmos and Creation, One Lay Person's View)



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SLIDE: Introduction

Before I start, I should make clear that I really have no credentials to talk about this subject. Physics has changed a lot since I received my undergraduate degree and I have kept up only through casual reading. Not being an expert, however, gives me somewhat more freedom to speculate about some areas of causality and interdependence than would otherwise be the case. I don't have to justify my thesis with formal rigour nor provide experimental proof.

SLIDE: World views

Today we will wander through some observations from several sides of the debate over the “necessity” of a creator versus the alternatives.

Before proceeding, I would like to review a few interesting discussions on “world views” and their influence on how we in turn view our world.

SLIDE: Plato's cave allegory

Some time ago, those fortunate to have attended a lay service given by Leo Ferrari will recall the “Allegory of Plato's Cave” in which we are given a vision of people as prisoners, confined to a limited view of shadows cast upon the wall by pupeteers who perform on a

balcony behind them.

SLIDE: Plato's cave

While there is more to the allegory, I was struck by the resemblance between this view and that of some current cosmological theories which see our perception as a four dimensional projection of an up to eleven dimensional existence.

SLIDE: Hindu world mythology

According to Hindu mythology, the world is supported by four elephants which ride on the back of a mighty turtle. The usual question is upon what does the turtle stand and the answer is another turtle. If you pursue the line of questioning, the answer is let's have none of that foolishness, it's turtles all the way down. If we have time, I want to come back to this.

SLIDE: Flatland frontspiece

In 1884 Edwin Abbott wrote a wonderful little essay about a hypothetical two dimensional world called "Flatland", in a book of the same name. Abbott also puns a bit in that the protagonist of the story is a geometrical square inhabiting the world. Hence writes

under the pseudonym “A Square” while Abbott’s name might also be written as A^2 .

SLIDE: Line land

In the story, the square encounters “line land” in which the inhabitants are line segments confined to a simple one dimensional world. These creatures can only directly know the creatures on either side of them. The square pities such creatures who can never know the liberation and freedom of his two dimensional world.

SLIDE: Point land

Later, however, he encounters the single inhabitant of “point land” and listens while the creature sings in great contentment that since it is all there is to existence, it is everything and knows everything.

SLIDE: Sphere 1

These two experiences, perhaps help prepare the square for his next encounter when, one day, out of nowhere, a round creature suddenly appears, grows progressively larger then smaller and disappears again. This happens several times until the creature explains that it is a three dimensional creature who has come to enlighten

the poor limited inhabitants of flatland.

SLIDE: Flatland sphere

As the square begins to understand what is happening, he suggests that perhaps there are higher dimensions again but the sphere is immediately aghast and insists “No! No! Only three, there are no more dimensions!”

It always is difficult to comprehend what we can not directly experience.

SLIDE: Anthropic principle

To change our frame of reference a bit, let us turn to more recent times. In studying the universe around us, physics and cosmology have defined many constants. While some constants have precise values defined by theory or mathematical principle (for example, π , the ratio of the circumference to the diameter of a circle) many other constants have no particular theoretical reason for having the value that they have in our universe. While there is no particular theoretical reason for them to have their values, at the same time, were their values significantly different from what they are, our universe would be a very different place.

Take specifically, the weak nuclear force which controls radioac-

tive decay. If it were stronger, nuclear reactions would be much more difficult and it is unlikely that stars would be able to generate the energy that they do and support life. Much weaker and stars would burn so rapidly that life would not have time to form and evolve. Some people, notably Roger Penrose, a mathematician, have calculated what the odds are against the various constants all having just the right values for a universe that could support life. They typically obtain fantastically small odds. Penrose's odds are one in ten raised to the 123 power. Think of it, that is a number with 1 followed by 123 zeros. We don't have names for numbers that high. Keep it in mind, we'll come back to it.

Having determined that the odds against a universe like ours is so fantastic, their conclusion is that some guiding force must, of necessity, have created the universe. It's this conclusion that I want to examine.

SLIDE: GUT

I titled this talk "Cosmos and Creation" and we've taken a rather disjointed tour through a number of world views. One of the things physicists are trying to do is obtain a "Theory of Everything", a relatively simple set of equations that describe all the forces of nature and explain them as just different manifestations of the same basic phenomenon. The four forces of nature are gravity, electromagnetism, and the weak and strong nuclear forces. The middle two

were unified as the electro-weak force in 1974 at very high energies. These and even higher energies during the first few instants of the “big bang” at the start of creation would allow the unification of the strong nuclear force as well.

SLIDE: Gravitational force

Gravity, however, despite the fact that it holds galaxies and solar systems together, is an extremely weak force. It takes all the mass of the Earth for example, just to exert a force of about ten newtons on a kilogram mass near its surface. To unify gravity with the other three forces during the “big bang” requires a model in which the universe would have to be much smaller than would otherwise be indicated at a very early point in creation.

SLIDE: Inflationary model

To reconcile the discrepancy, the “inflationary model” was proposed. Essentially for a few tiny fractions of a second, the nature of the universe was radically different and could expand at many times the speed of light from essentially a point to near its present dimensions, then the current speed limits kicked in and things began to settle down. When I first encountered this model, it disturbed me greatly. It still does.

SLIDE: 3D

What does appeal to me is more recent theoretical work which seeks to unify gravity with the other forces not by using extremely (some might say impossibly) high energies but by a more creative approach. On observable scales, gravity falls off in an inverse square relationship with distance. This is a natural relationship for any effect which is dispersed evenly over a spherical surface.

SLIDE: Gravitational force

If we were to assume that our universe extends into additional dimensions as a cylindrical projection, then near each point, forces affected by the projection would actually fall off as the third power of distance but as the distance approaches the diameter of the cylinder, the effect diminishes until there is no more dispersal. If gravity is a force that projects into this additional dimension then we could have a much stronger force at small scale.

As it happens, to unify gravity with the other forces would require cylinders with a diameter on a planetary scale and we would readily observe such a phenomenon. By increasing the number of additional dimensions, we get unification at distances of the order of nuclear distances at about ten dimensions.

SLIDE: Conclusion

There is no hard evidence for this theory, however, it is an elegant way to unify gravity with the other forces of nature. At the same time, it allows us to reexamine the argument of the necessity of creation by design. If there is only one universe, then the odds on one so nicely suited for our existence is extremely slim, however, if we look at it the other way and assume that the odds are realistic, then another explanation is that there are many universes stacked side by side along the different dimensions, packed as closely as the cylindrical projections of the universes will allow. For our universe to reasonably exist, then there must be on the order of ten to the 123 such universes and probably many more.

The idea of parallel universes is a favourite of science fiction writers. Isaac Asimov in “The Gods Themselves” postulates a universe in which the weak nuclear force is somewhat stronger than in ours and alien beings whose cold dark sun no longer provides the energy they need are able to swap matter and with it a bit of the universe. While being first rate science fiction, the book is worth reading for the portrayal of faculty in-fighting and an examination of human nature best demonstrated by the little boy when told that a certain pleasurable activity would make him blind asks “well, can I do it until I need glasses?”

Parallel universes is also an underlying concept in Douglas Adam’s

fifth volume of the Hitch Hikers' Guide to the Galaxy trilogy, "Mostly Harmless" in which the guide has become much more than a friendly cover with the advice "Don't Panic". A powerful system which by asking some questions of the user determines the nature of space time in the universe in which it is operating and makes reference to the next dimension after time as being the "First Fundamental of Probability". An interesting concept, however, given the odds on some of the things I've experienced, I think we're probably on one of the weirder harmonics.

I want to stress that this is not proof that there are so many universes nor of additional dimensions, simply that this is an alternate explanation and that the incredible odds are not in and of themselves proof nor even necessarily strong evidence of intelligent design in creation. As Ms. DeMent so plaintively sings, we must let the mystery be.

If time permits, I want to revisit the Hindu world model. Primarily the problem of what supports the turtle. At least in the joke, some acknowledgement is made to the problem of recursion. Another argument of the intelligent design proponents is that a creation necessarily implies a creator. The argument of course immediately leads to infinite recursion again since each creator will require a more powerful uber-creator. If any of the creators can stand alone, then of course creation itself can also stand alone. There may indeed be a creator, but there is no a priori need for one.

Swiss watches (one of the favourite examples of intelligent de-

sign) can spontaneously appear out of nowhere, however, it takes several billion years and incidentally involves the evolution of sentient beings that perceive a need of precise time pieces. If there was an intelligent designer, then it has a lot to answer for.

SLIDE: Thistle

To see a world in a grain of sand
and heaven in a wild flower.
Hold infinity in the palm of your hand
and eternity in an hour.

William Blake (*Auguries of Innocence*)