

April 26, 2010

Reading - Chapter 13, 14

Wheeler back to Washington DC, T - Th. Class Wednesday will be excerpts from PBS program, The Elegant Universe with Brian Greene.

Astronomy in the News? Discovery Channel series “Into the Universe” with Stephen Hawking. Premier last night, “Life in the Universe” and “Time Travel.” Rough-looking black hole event horizon?? Flat worm hole. Refers to “crevices, wrinkles, and voids” in time in the context of “quantum foam.”

Pic of the Day - dust pillars in the Carina Nebula



With time machines, the future is already “there” in space-time

Premise of many famous time travel movies is undone, cannot change the future by tinkering in the past.

Implication - no free will

We just live through time with impression we are making choices

Novikov - I exert my free will to fly around the room or to walk through solid walls

Physics says I cannot - what's the big deal?

Likewise - I cannot will a time travel paradox, physics says “no.”

Hawking program - seems to accept paradoxes as problem, no nod to Novikov.

Novikov Consistency Conjecture: physics will arrange itself so that there is no time-travel paradox - you cannot travel back in time and kill yourself before you enter the worm hole/time machine.

Back to the Future films





Terminator films

Consistent or not with the Novikov Consistency Conjecture?

Rumor - Thorne talking to Spielberg...

One Minute Exam

The Novikov Consistency Conjecture says:

-  Worm holes cannot lead to the future
-  Worm holes cannot lead to the past
-  Worm holes cannot exist
-  Worm holes cannot lead to time travel paradoxes

Ultimate resolution - will not know if worm holes can be constructed, even in principle, without a theory of *quantum gravity*.

Hawking - vacuum fluctuation energy (from uncertainty principle applied to vacuum) can go into wormhole, come out in past, pile up at mouth where began, quickly build up huge energy density, curve space, slam worm hole shut.

Maybe, but cannot actually compute that process without a theory of quantum gravity to handle the change in the “connectivity” of space time - must space time be smooth, or can it be laced with “tunnels” in space and time?

Need quantum gravity theory of singularity, quantum foam, worm holes

The best current candidate for a theory of Quantum Gravity is String Theory

See Brian Green - The Elegant Universe

(<http://www.pbs.org/wgbh/nova/elegant/>)

Read ***The Universe on a String*** editorial by Brian Green posted under links -> string theory

Hyperspace is an intrinsic aspect of string theory - 10 dimensions of space, plus time.

Background - pre-Einstein late 19th, early 20th Century

Where does space curve to?

Riemann (1826 -1866), Lobachevsky (1792 - 1856)

Theory of curved space, non-Euclidian geometry

Notions of 4D hyperspace affected art/culture turn of 20th century

Flatland - Edward Abbott

Tesseract - 4D hypercube (Elegant Universe link)

3D “unfolding” of tesseract in Salvadore Dali’s

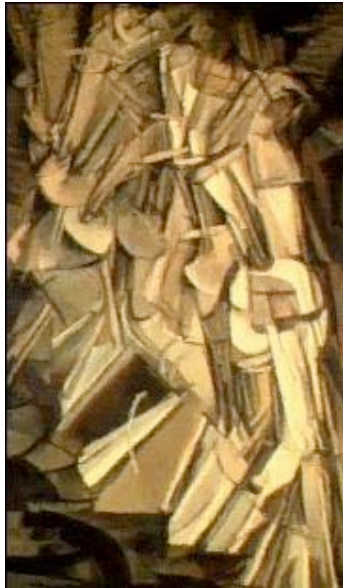
Crucifixion (Corpus Hypercubas)



Notions of seeing from different directions at once

Perspective of Cubism

Picasso - Les Demoiselles d'Avignon



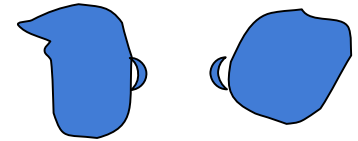
Deschamps - *Nude Descending A Staircase*

Contemporary Brazilian artist Marcos Novak -
3D projections of 4D objects



Hyperspace Perspectives (reflected in cubism?)

2D creature - another 2D creature sees the front



From 3D, we see front, back and *inside* simultaneously

In our 3D space we see the front of another 3D creature

A being living in a 4D hyperspace would see all of our surface, front and back, and our insides, all at once!

A 3D creature passing through a 2D Universe would start as a point, grow to a finite *area*, then decrease to a point and disappear.

A 4D creature passing through our 3D Universe would start as a point, grow to a finite *volume*, then decrease to a point and disappear.

Sagan YouTube

Living and perceiving different dimensions

<http://www.youtube.com/watch?v=Y9KT4M7kiSw>