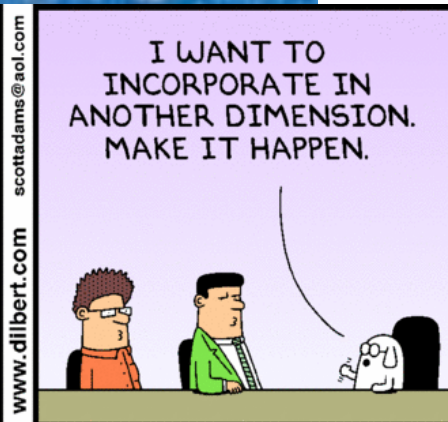
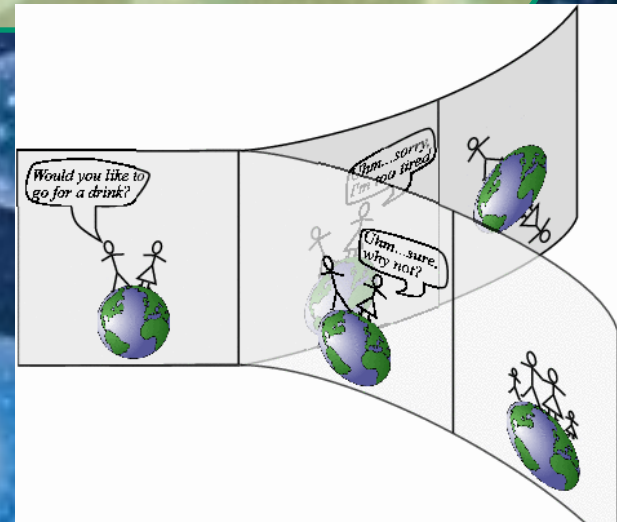


Welcome to Physics 102

This class is a survey of our universe as seen by modern science and an exploration of concepts of a multiple universe reality. Physics 102 is designed for non-science majors. The course is conceptual and the use of mathematics will be limited.

Savage Chickens

by Doug Savage



Welcome to Physics 102

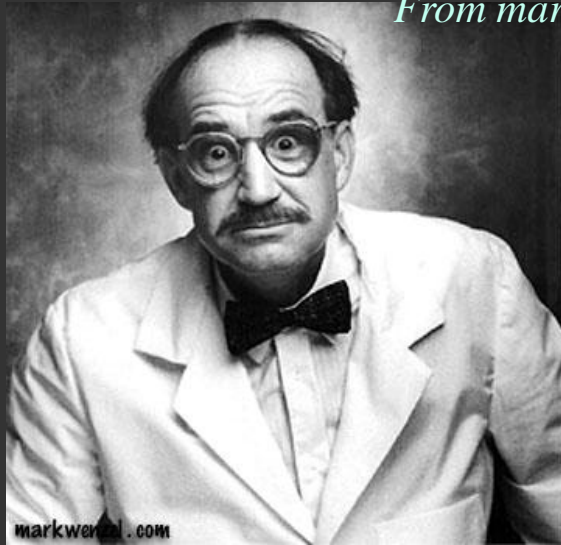
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- motion
 - String theory
 - Energy
 - Gravitation
 - Rotational motion
 - Waves
 - light
 - electricity and magnetism
 - nuclear forces
 - Standard Model of particle physics
 - The Big Bang
 - Dark matter
 - stellar evolution
 - Special Theory of Relativity
 - General Theory of Relativity
 - Quarks, leptons, gluons, baryons, mesons, etc.
 - cosmic microwave background
 - quantum mechanics
 - Heisenberg's Uncertainty Principle
 - radiation
 - nuclear bombs
 - **at least 11 different multiple universe concepts**
- No previous physics instruction is assumed.

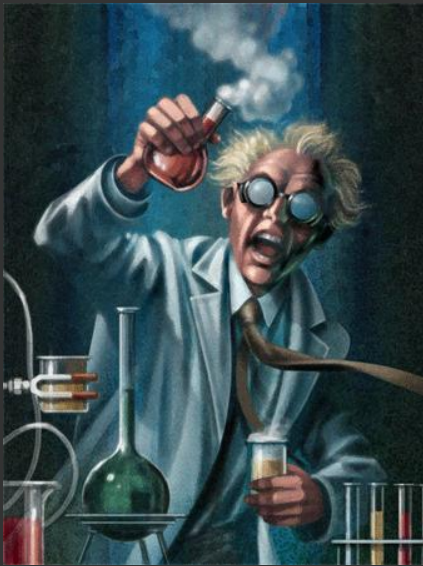
**Physics 102 – Visions of the Multiverse
Spring term 2011, University of Rochester**

This is an introductory course designed especially for students in the humanities and other non-scientific fields who are interested in learning about science, physics and concepts of a multiple universe reality. Topics include the nature of science, Newton's laws, relativity, light, quantum mechanics, the nature of particles and forces, and cosmology. In the course of surveying the modern scientific view of the universe, a number of serious concepts of a multi-universe reality will be examined, including the many-worlds view of quantum mechanics, inflationary and string-based cosmologies. There are no prerequisites, no background knowledge is required and the material will be presented with very little mathematics. Substantial use will be made of demonstrations. This course is intended to be equivalent to our Physics 100 course in terms of satisfying cluster requirements.

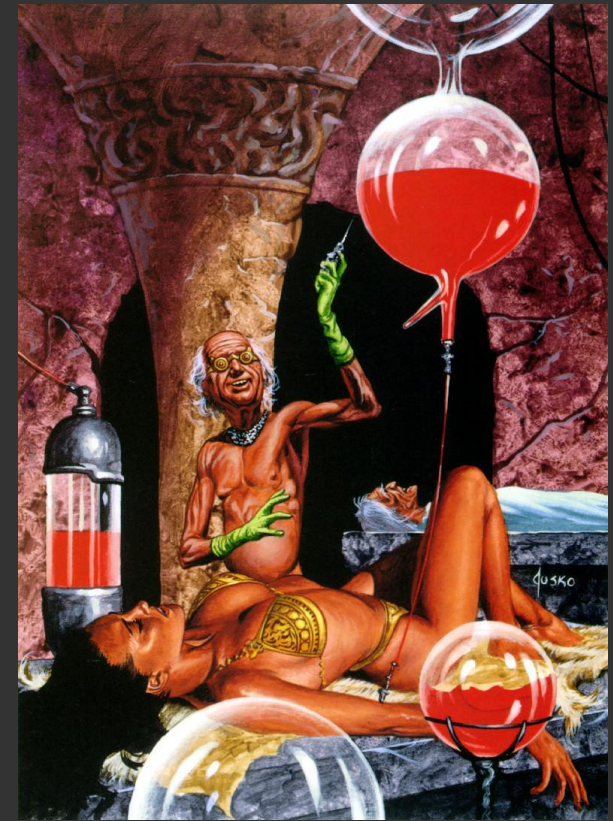
From markwenzel.com



The nature of science



From scientifica.eu

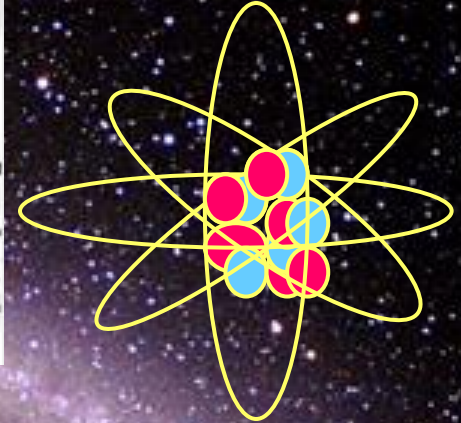


From theduogroup.com

From www.robortocampus.com



Confronting Human bias



**The intimate relationship
between the very big and the
very small**



**Concepts of the a multiple
universe reality**

J. Baum/SPL, from nature .com

Professor Steven Manly

B&L 203E

5-8473

steven.manly@rochester.edu

http://web.pas.rochester.edu/~manly/class/P102_2014S/

Inga Koch

(ikoch@u.rochester.edu)

Christina Loniewski

(cloniews@u.rochester.edu)

Evaluation:

Attendance and participation in recitations

Writing and ranking of essays/conceptual summaries

Do all of what is asked, engage, think, participate

Do most of what is asked, participate often, engage and think some

Do much of what is asked of you, don't really engage or think much about it, pretty minimal effort

Signed up for but not really in the course.

Recitations begin next week (Wed., Jan. 22)

No class this Monday (MLK)

No lecture in Hoyt on Wed. Jan. 22 (slides and audio will be posted on the class website)

Recitations:

- Wed. 4:50-6:50 MEL 206
- Wed. 7:40-9:40 Dewey 4162
- Other 2 sections listed by registrar are cancelled.

Writings due when?

Rankings due when?

First writing assignment ... essay:

You voted “yes or no” for whether or not you think that there is such a thing as scientific truth.

Before doing the reading this week (given on class website), write a short paragraph or two motivating/defending your vote.

Do the reading.

Write a paragraph or two bolstering your earlier argument(s)
OR finding fault with your earlier argument(s) and making the other case.

What is a universe?

Universe



From Wikipedia, the free encyclopedia

For other uses, see [Universe \(disambiguation\)](#).

The **Universe** is commonly defined as the totality of existence,^{[1][2][3][4]} including [planets](#), [stars](#), [galaxies](#), the contents of [intergalactic space](#), and all [matter](#) and [energy](#).^{[5][6]} Similar terms include the *cosmos*, the *world* and *nature*.

The [observable universe](#) is about 46 billion light years in radius.^[7] Scientific observation of the Universe has led to inferences of its earlier stages. These observations suggest that the Universe has been governed by the same physical laws and constants throughout most of



u·ni·verse  [yoo-nuh-vurs]  [Show IPA](#)

noun

1. the totality of known or supposed objects and phenomena throughout space; the cosmos; macrocosm.
2. the whole world, especially with reference to humanity: *a truth known throughout the universe.*
3. a world or sphere in which something exists or prevails: *his private universe.*

“Multiple universe” ... an oxymoron?

Before the many, define the one ...

What is “the universe”?

Hubble deep field
photo

23 day exposure

The universe (my working definition):

Everything that exists or could ever exist, in principle, in our experience. (“Our experience” includes things inferred by instrumentation.)

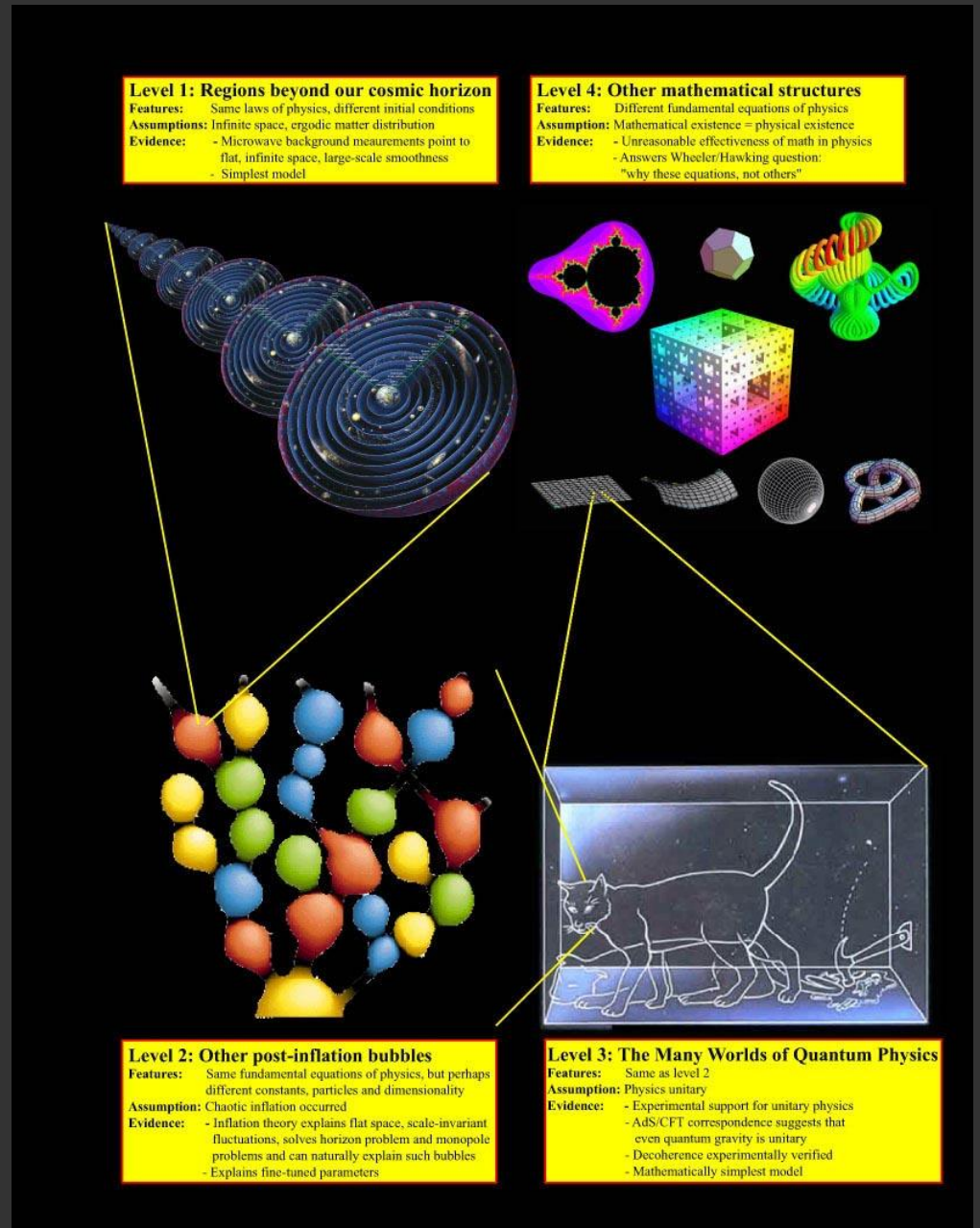
Everything to which we are causally connected, now or in the future.

Max Tegmark's multiverse taxonomy

Classified by level of abstraction/complexity



Cosmologist
at MIT



My populist taxonomy –
classified according to primary
form of separation of the
universes

Space-time separated

Dimensionally separated

Faith-based

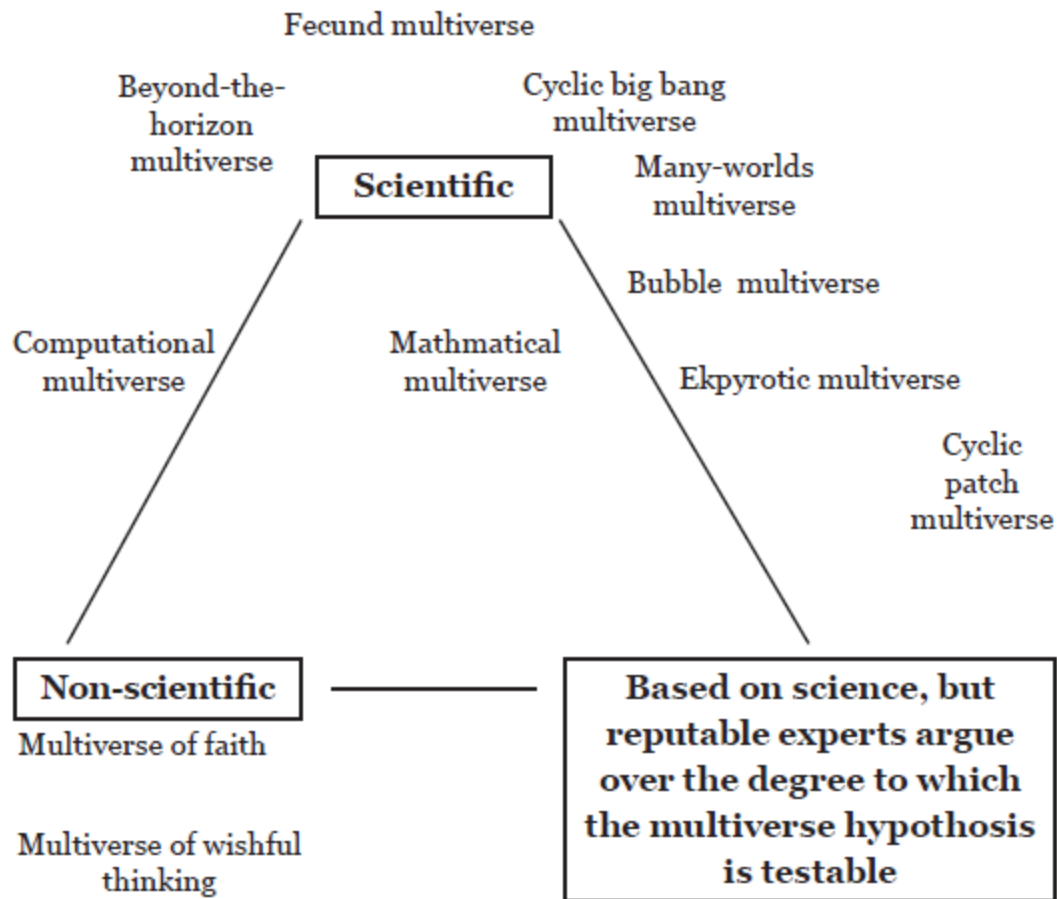


Figure 1.1: Relative degrees to which different multiverse concepts are scientific.

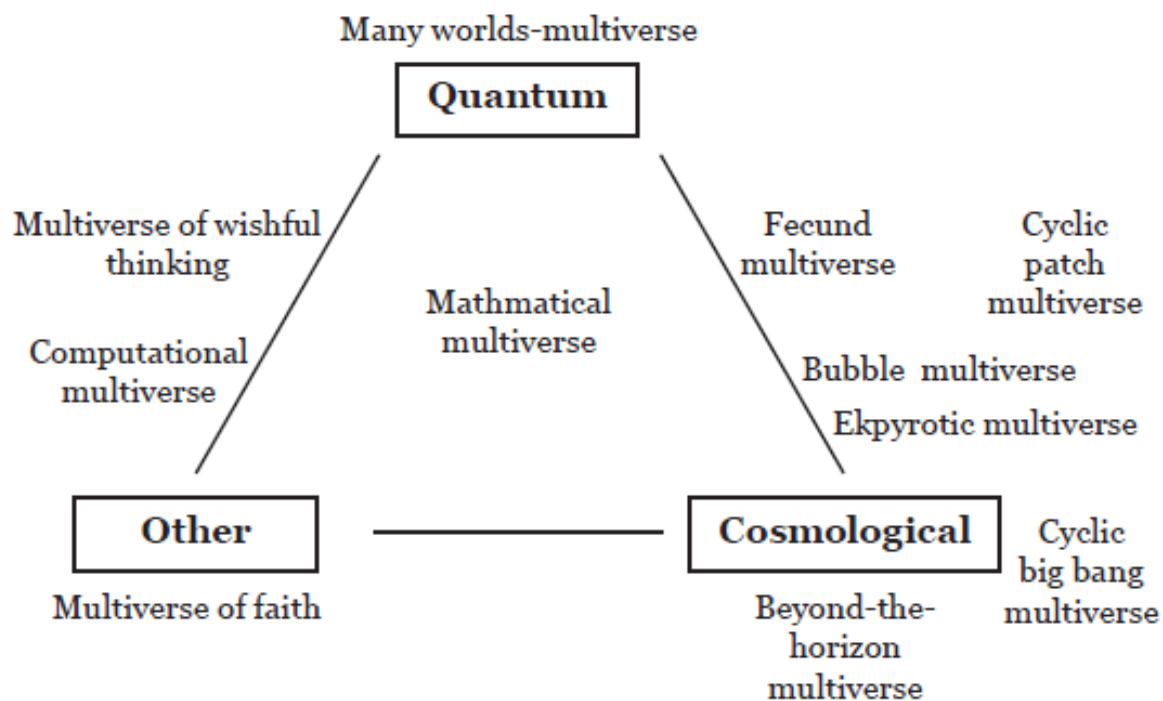


Figure 1.2: Relative degree of quantum versus cosmological character for different multiverse concepts.

In terms of the physical world, what is the human experience?

<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/index.html>

Even within your experience, how closely do you observe the world around you?