A TWO-STEP INTEGRATED THEORY OF EVERYTHING (TOE) –Revision A

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A Two-Step Integrated TOE – Revision A http:viXra.org/abs/1602.0237

P060116

Introduction

- Two opposing Theory of Everything (TOE) visions
  - Two-Step Integrated TOE - fundamental physics step and math step
  - Prevailing Hawking's single math step
  - Two steps are essential
    - Unknown answers to key outstanding physics questions
      - What are Higgs forces, dark energy, dark matter, stellar black holes, etc.
      - What caused start of universe, baryogenesis, cosmological constant problem, etc. ?
    - Single math step is dependent on these questions, but cannot answer them by itself
  - Single math step TOE has had near zero results after a century of attempts
- Three goals of my fundamental physics step
  - "Everything" defined – 20 interrelated amplified theories & physical relationships
    - String, particle creation, inflation, Higgs forces, spontaneous symmetry breaking, superpartner/ SM decays, neutrino oscillations, DM, universe expansions, DE, messenger particles, relative strengths of forces, Super Universe, stellar black holes (BH), BH entropy, arrow of time, cosmological constant problem, BH information paradox, baryogenesis, and quantum gravity
    - Definition required 10 years and brute force technique using 250 TOE article iterations
    - Presentation describes replacement of 5 <u>independent existing</u> theories having no interrelationships by 20 <u>interrelated amplified</u> theories having intimate relationships (Table V)
  - Answered all above key outstanding questions
  - Provided correct inputs (e.g. 129 matter/force particle types) for two part math step
    - Amplified E8 Lie algebra and amplified N-body simulation

Introduction (Cont.)

- Our universe's 128 matter and force particle types created from super force
  - Matter creation from the beginning of inflation at $t = 5 \times 10^{-36}$ s to $t = 100$ s
  - Extremely high temperatures between 10^{27} and 10^{10} K
- By $t = 100$ s and 10^{10} K, only 22 permanent matter/force particle types remained
  - Atomic/subatomic matter (up quark, down quark, electron, electron-neutrino, muon-neutrino, and tau-neutrino) constituted 5% of universe's energy/mass
  - Dark matter or the zino, photino, and three permanent Higgsino types associated with the graviton, gluon, and photon 26%
  - Dark energy or eight Higgs force energies associated with (up quark, down quark, electron, electron-neutrino, muon-neutrino, tau-neutrino, zino, and photino) 69%
  - These percentages remained constant for 13.8 billion years, no quintessence.
- Universes created via four sequential star gravitational collapse stages (degeneracy pressure)
  - White dwarf star, molecules decomposed to atoms
  - Neutron star, atoms decomposed to neutrons, protons, and electrons
  - Super supermassive quark star (matter), protons and neutrons decomposed to up and down quarks
  - Super supermassive black hole (energy), up and down quarks evaporated to super force particles
  - Matter decomposition intimately related to and the reverse of our universe's matter creation.

String Theory

- A single string theory unites all known physical phenomena from the near infinitely small (Planck cube) to the near infinitely large (Super Universe)

- String theory amplifications

    - 129 fundamental matter/force particles reside in Planck cubes as closed strings

        - 16 SM, 16 superpartners, 32 anti-particles, 64 super supersymmetric Higgs particles, and the super force or mother particle

        - Represented by point particle (zero brane), closed string (one), or Calabi-Yau membrane (two)

        - 6 extra dimensions are point particle position & velocity in Planck cube

    - Any object in Super Universe (multiverse) defined by volume of contiguous Planck cubes

        - Proton, atom, encyclopedia, person, quark star, galaxy, or entire Super Universe

    - Super force string doughnut physical singularities existed at the center of Planck cubes at start of Super Universe, all precursor universes, and all universes

        - Our universe's doughnut physical singularity contained 10^{54} kg (10^{94} K) of energy

        - Physical singularity was created in our precursor universe by the evaporation, deflation, and collapse of a maximum entropy super supermassive quark star (matter) to a minimum entropy super supermassive black hole (energy) or Kerr-Newman black hole

- Pauli's exclusion principle

    - Exists for electron in atom as 4 quantum numbers

    - Pauli's exclusion principle amplified for "free" electron, up quark, etc., particles

        - No two matter particles can occupy the same Planck cube

        - Force particles can occupy the same Planck cube (e.g. super force physical singularity)

# Proposed Standard Model/Supersymmetric matter and force particles

Symbol	Standard Model	Matter	Force	Symbol	Supersymmetric	Matter	Force
p_1	graviton		x	p_{17}	gravitino	x	
p_2	gluon		x	p_{18}	gluino	x	
p_3	top quark	x		p_{19}	stop squark		x
p_4	bottom quark	x		p_{20}	sbottom squark		x
p_5	tau	x		p_{21}	stau		x
p_6	charm quark	x		p_{22}	scharm squark		x
p_7	strange quark	x		p_{23}	sstrange squark		x
p_8	muon	x		p_{24}	smuon		x
p_9	tau-neutrino	x		p_{25}	stau-sneutrino		x
p_{10}	down quark	x		p_{26}	sdown squark		x
p_{11}	up quark	x		p_{27}	sup squark		x
p_{12}	electron	x		p_{28}	selectron		x
p_{13}	muon-neutrino	x		p_{29}	smuon-sneutrino		x
p_{14}	electron-neutrino	x		p_{30}	selectron-sneutrino		x
p_{15}	W/Z's		x	p_{31}	wino/zinos	x	
p_{16}	photon		x	p_{32}	photino	x	

# Proposed standard/supersymmetric particle symbols

- Two reasons for replacing inadequate existing matter and force particle symbols
  - Explicit Higgs particle representation
  - Elimination of existing symbol ambiguities via standardization of subscripts and capitals.
- Explicit Higgs particle symbols required
  - A Higgs particle for each of 64 matter and force particles
  - A matter particle has associated Higgs force, a force particle has associated Higgsino
  - Sum of eight Higgs force energies associated with eight permanent matter particles is dark energy
  - Zino, photino, and three permanent Higgsino types (graviton, gluon, photon) are dark matter
- Six examples of existing symbol ambiguities eliminated via standardization of subscripts and capitals
  - Eight types of gluons p_2 explicitly represented by p_{2a}.........p_{2h}
  - Photon p_{16} categorized into two types p_{16a} for electromagnetic radiation and p_{16b} for force carrier
    - Electromagnetic radiation is further subdivided into gamma ray p_{16a1}, X rays p_{16a2}, etc.
    - Existing photon symbol γ illustrates ambiguities, all electromagnetic & gamma ray defined by γ
    - Force carrier photon is not defined
  - W/Z's (p_{15}) are hybrid matter/force particles. W/Z's are transient matter particles with force particle spins of 1 and are associated with Higgs forces (h_{15})
  - 64 super force types not one
  - Total particle energy/mass represented by an upper case, e.g. P_{11} is total up quark energy/mass
  - 64 super force energy densities not one

Particle Creation

- Big Bang timeline X axis had two scales, time in seconds and temperature in Kelvins

    – Intimate relationship between matter creation time and matter energy/mass

- Matter creation amplified to be time synchronous

    – Inflation start time

    – One to seven Planck cubes energy to energy/matter expansion

- Upper case letters used in Big Bang Timeline

    – Particle creation involved total particle energy/mass, for example, P_{11}

- Total energy/mass (e.g. P_{11}) consisted of three types of energies

    – Rest mass

    – Kinetic (translational and rotational)

    – Potential (gravitational, electromagnetic, nuclear binding)

**Big Bang Timeline**
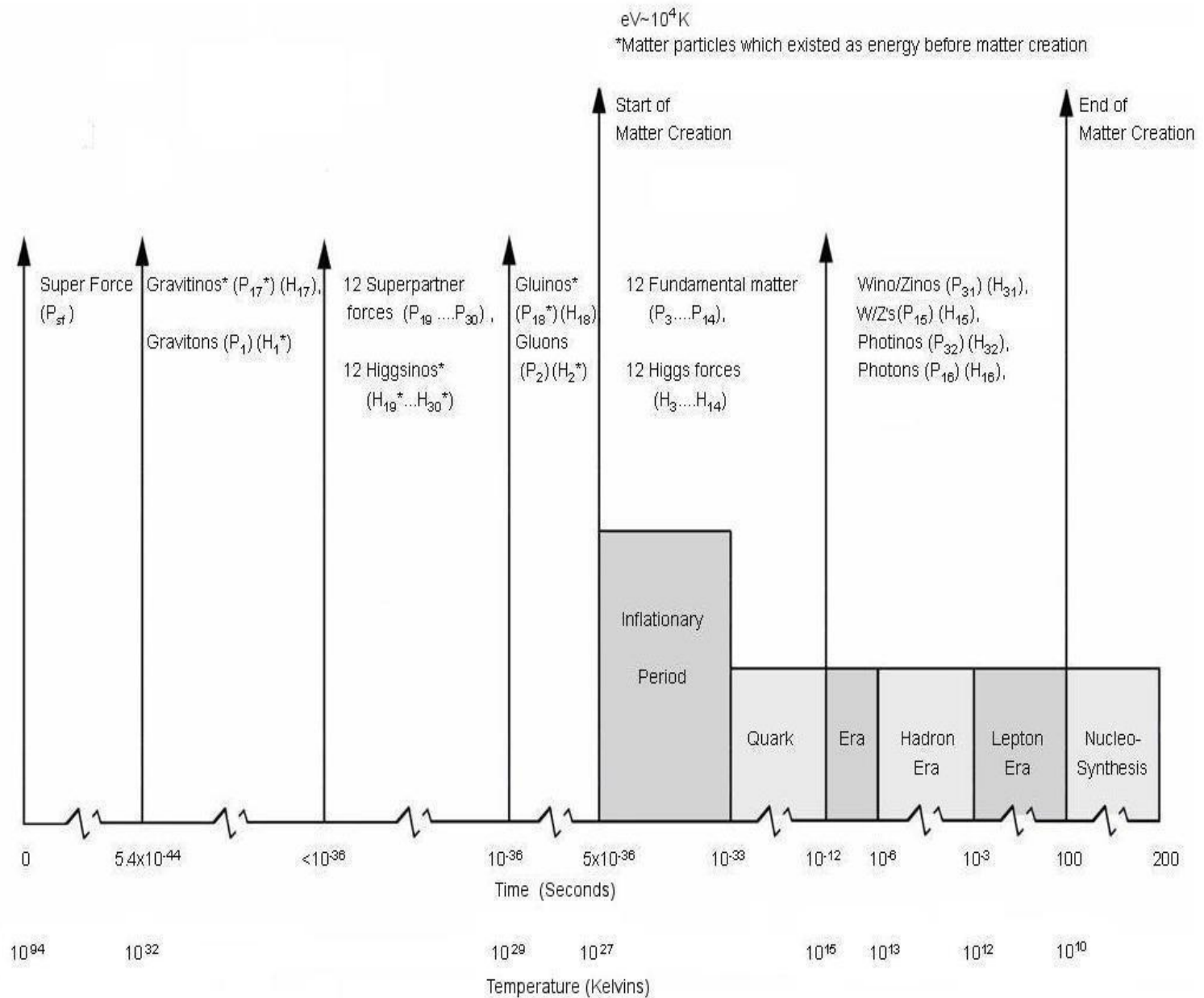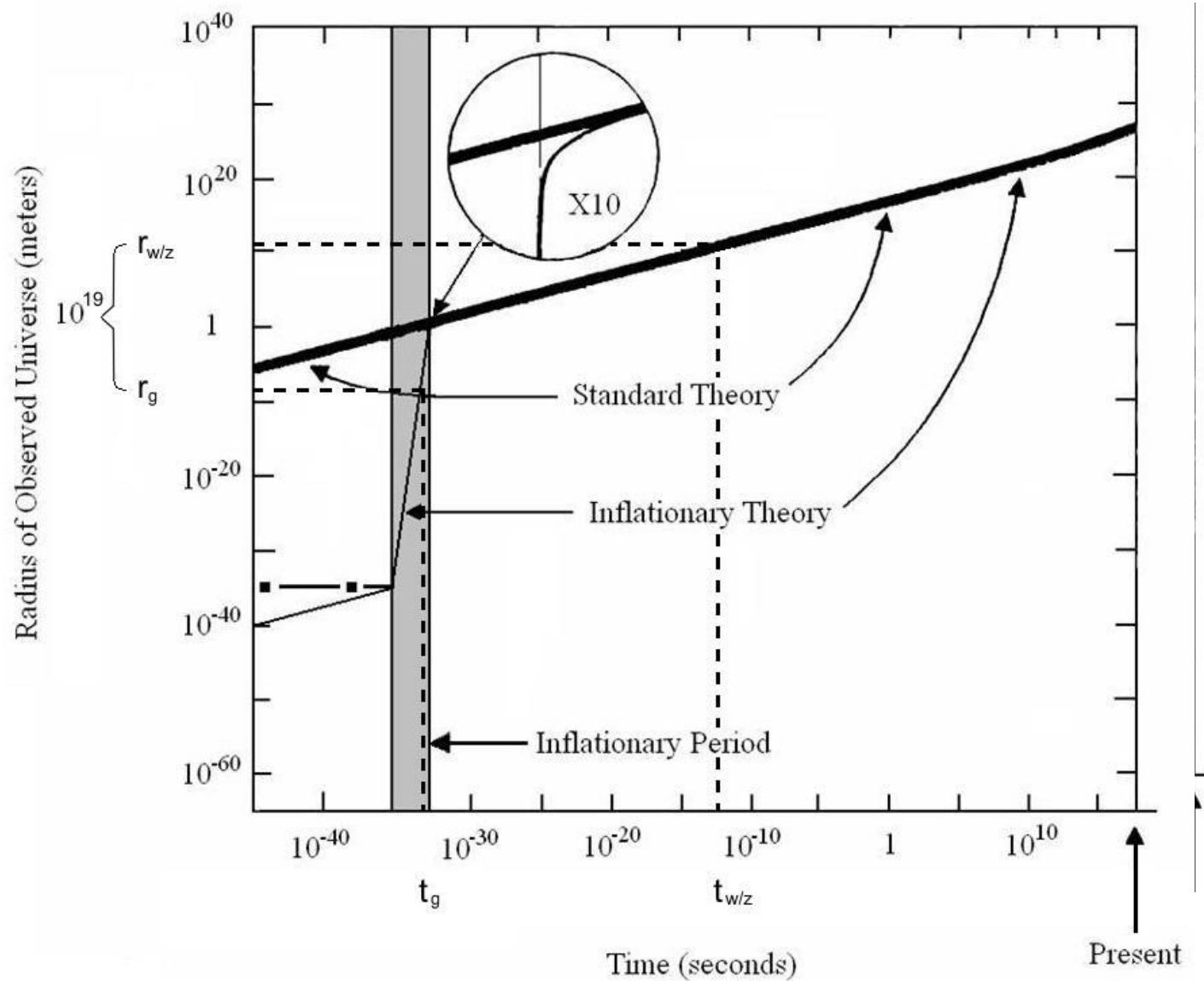
Size of Universe

Higgs Forces

- Amplifications of Higgs forces were key to Two-Step Integrated TOE
  - Super forces were God particles and 100% of our universe's energy/mass
    - Higgs particles were associate God particles and approximately 82%
    - Sum of eight Higgs force energies associated with eight permanent matter particles was dark energy (69%)
    - Dark matter was zinos, photinos, and three permanent Higgsino types (26%)
      - Assuming three permanent Higgsino types were half of dark matter's (13%)
      - Eight Higgs forces + three permanent Higgsino types were 69% + 13% = 82%
  - Matter particles and associated Higgs forces were one and inseparable
    - Undersized porcupine with overgrown spines
  - Extremely high temperatures in our early universe caused spontaneous symmetry breaking, not the Higgs force
    - Higgs force was product not cause of spontaneous symmetry breaking
    - Similar to 3 H_2O phases condensation steam, water, ice
  - Higgs force was a residual Super force (contained mass, charges, spin of matter particle)

Higgs Forces (Cont.)

- Mass given to a matter particle via Higgs force and gravitational force messenger particles
- Spontaneous symmetry breaking was bidirectional
  - Super force condensed into a matter particle/Higgs force
    - Matter particle/Higgs force evaporated to the super force
  - Beta decay equation
    - Down quark (p_{10}) $\rightarrow$ up quark (p_{11})+ W$^-$ (p_{15})
    - Correct results with misunderstood process, because indivisible fundamental matter particles cannot be split
  - Correct beta decay equation (Amplification with Higgs force)
    - Down quark (p_{10} + h_{10}) $\rightarrow$ super force (p_{sfp10})$\rightarrow$ up quark (p_{11} + h_{11}) + W$^-$ (p_{15} + h_{15})
    - Decays were series of evaporations/condensations to and from super force
- Bidirectional evaporation/condensation process key to
  - Baryogenesis
  - Quark star (matter) evaporation to associated black hole (energy)

Up Quark Baryogenesis and Spontaneous Symmetry Breaking Function

Fig. 4. Inset
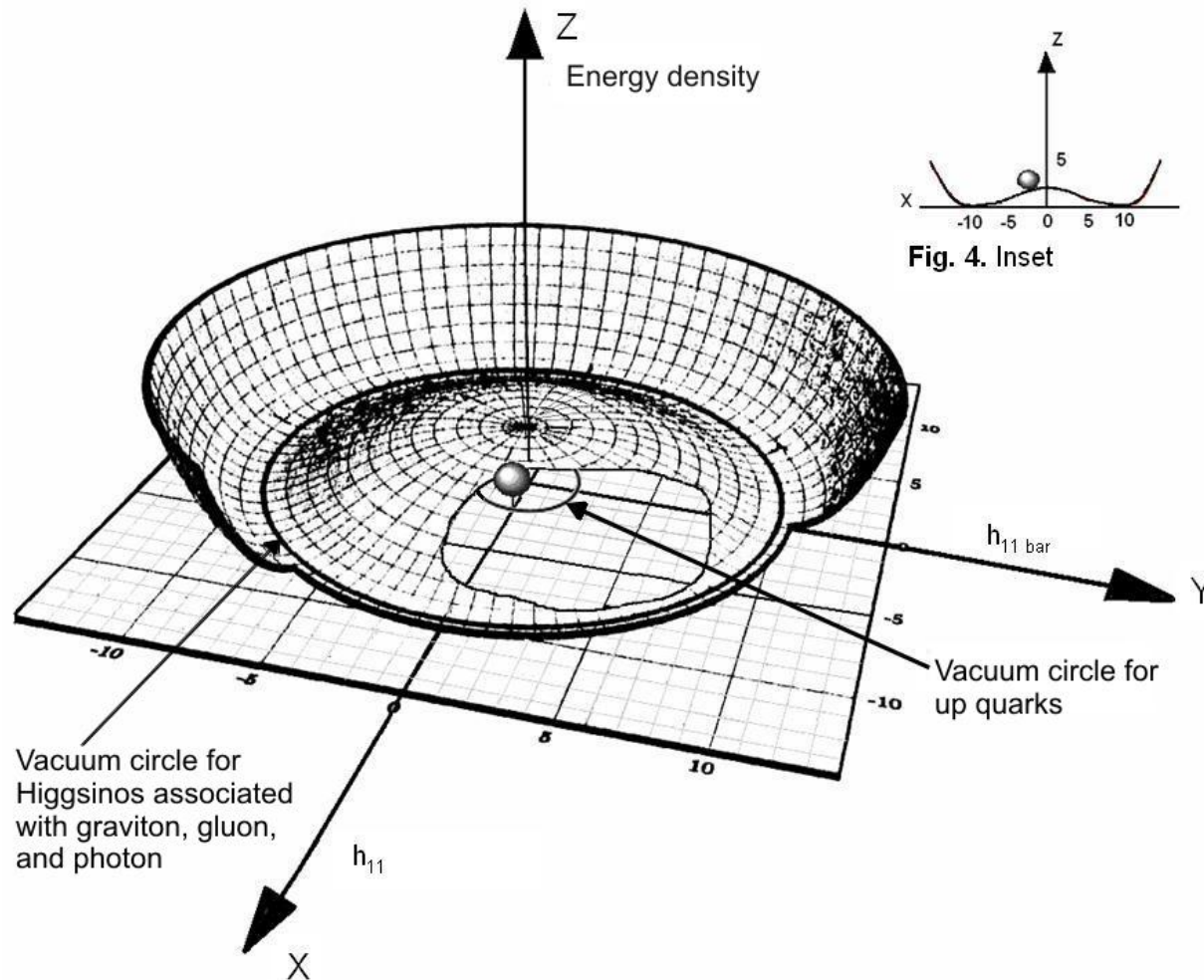
Two Types of Spontaneous Symmetry Breaking

- Type 1 or 8 SM/supersymmetric permanent matter particles
  - 9 transient matter particles (top quark, bottom quark, charm quark, strange quark, tau, muon, gravitino, gluino, and W/Z's)
  - 8 permanent matter particles (up quark, down quark, electron, electron-neutrino, muon-neutrino, tau-neutrino, zino, and photino)
  - By 100 s, 9 transient matter particles/Higgs forces evaporated to the super force and condensed to 8 permanent matter particles/Higgs forces (decay)
  - Each permanent matter particle had same generic up quark Mexican hat shape
    - Different peak super force energy density (peak z coordinate)
    - Different Higgs force (ball x coordinate)
- Type 2 matter particles or 3 permanent Higgsino types with graviton, gluon, and photon
  - Ball comes down Higgsino baryogenesis/spontaneous symmetry breaking function in the XZ plane until intersection with vacuum circle for Higgsinos
  - Super force energy condensed entirely to a Higgsino and none to its associated force particle
- Type 3 matter particles or 12 supersymmetric Higgsinos associated with 12 superpartner forces
  - Did not experience baryogenesis/spontaneous symmetry breaking
  - 12 superpartner forces, 12 associated Higgsinos, and 24 anti-particles were X bosons or inflatons
  - X bosons (inflatons) were the latent energy which expanded our universe during inflation period

Superpartner and SM Decays/Neutrino Oscillations

- Decays are series of evaporations/condensations of matter particles/Higgs forces to and from super force
  - Heaviest matter particles condensed directly from the super force
    - Lighter matter particles were created primarily via decay of heavier particles
    - Decays were gauge mediated interactions
    - Heavier matter decayed to lower energy/mass matter and intermediate forces
    - Intermediate force particles were W/Z's for SM particles and winos for supersymmetric particles
      - W^- decayed to an electron and an anti-electron-neutrino
      - Winos decayed to SM particles (quarks and leptons)
  - Superpartner decay chain ended with Lightest Supersymmetric Particles (LSPs) or zinos and photinos
  - Stable LSPs included zinos, photinos, and three permanent Higgsino types
- Neutrinos oscillated between three flavors via the seesaw model using a neutral heavy lepton
  - Three neutrino flavors were: electron-neutrino, muon-neutrino, and tau-neutrino
  - In Seesaw model, neutrino mass was $(m_D)^2/M_{NHL}$, where m_D was SM Dirac mass and M_{NHL} was the neutral heavy lepton mass
  - Neutral heavy lepton assumed to be the stable fourth family neutrino, either a zino or photino

Dark Matter/Dark Energy

- Dark matter
  - Dark matter was the LSP or neutralino or amalgam of zino, photino, and 3 permanent Higgsino types
  - Dark matter agglomeration started at 30,000 years and formed the framework of galaxies
  - At 380,000 years, electrically neutral atoms formed and clumped around the dark matter framework
- Dark energy was the sum of eight permanent Higgs force energies
  - By t = 100 s, 8 permanent matter particles/Higgs forces and 3 permanent Higgsino types/SM forces remained
- Cosmological constant lambda (Λ) proportional to dark energy density (ρ_Λ), or $\Lambda = (8\pi G/3c^2)\rho_\Lambda$
  - Dark energy density
    - Uniformly distributed in our universe
    - Sum of eight permanent Higgs force energy densities
    - Decreased with time along with the cosmological constant as our universe expanded
- Baryonic matter could be changed only by big bang, stellar, or supernova nucleosynthesis
  - Nucleosynthesis changed total up and down quark rest mass without changing total baryonic energy/mass
    - 1% percent of proton/neutron's energy/mass was rest mass, 99% was nuclear binding energy
    - Nuclear binding energy was a fraction of total kinetic and potential energy
    - Converted rest mass energy and radiation absorbed by surrounding particles

Universe Expansions

- Four types of sequential universe expansions
  - First, t = 0 to t = 5 x 10^{-36} s
    - Driven by entropy increase of the super, gravitinos*, gravitons, etc. particles
    - Similar to loosening of a smaller than a Planck cube sized sphere of vibrating strings
  - Second, inflationary period expansion similar to water container freezing and bursting
    - More energy exists in liquid than frozen water
    - When water freezes, latent heat is released
    - X bosons (12 superpartner forces, 12 associated Higgsinos, and 24 anti-particles) were latent heat energy
  - Third, from 10^{-33} s to 30,000 years - uniform distribution of matter expansion
  - Fourth, from 30,000 years to the present time - non-uniform distribution of matter
  - Dark energy drove uniform/non-uniform distribution of matter expansions
- Product of non-uniform distribution of matter expansion rate and the graviton's intergalactic propagation time was string theory's seventh extra dimension

Messenger Particles/Relative Strengths of Forces (Hierarchy Problem)

- Messenger particles amplified to contain embedded clocks/computers
- Newton's gravitational force ($F = Gm_1m_2/r^2$) m_1 and m_2 masses, r range, G gravitational constant
    - Graviton extracts mass (m_1) from transmitting particle's Higgs force
    - Clock initiates at graviton transmission time t_t and stops at reception time t_r
    - Graviton computer calculates range factor ($1/r^2$) as $1/ [(t_r - t_t) (c)]^2$
    - Upon graviton reception receiving mass (m_2) extracted from the receiving particle's Higgs force
    - Graviton clock/computer calculates gravitational force, provides to receiving particle
    - Gravitational force consists of continuous series of graviton messenger particles.
- Relative strengths gravitational and electromagnetic/weak forces due to propagation factor dilution ($1/r^2$)
    - Gravitational force activated first and diluted by 10^{-39} (Hierarchy problem) by the time of electromagnetic/weak force activation
    - All forces were united and strengths equal at $t = 5.4 \times 10^{-44}$ s
    - Heaviest matter particle assumed to be gravitino
    - Gravitino (energy) created at 5.4×10^{-44} s but activated at gravitino condensation (t_g)
    - From size of universe figure
        - Gravitino energy/mass approximately 10^{25} K or 10^{21} eV
    - Supersymmetric particles were 100 to 1500 GeV (Snowmass)

Matter/Force Particle Accountability (128 Particles)

- 128 matter/force particle accountability by end of matter creation (t = 100 sec) was:
  - 18 transient particles 0%
    - 9 transient matter particles/Higgs forces (top quark, bottom quark, charm quark, strange quark, tau, muon, gravitino, gluino, and W/Z's) evaporated/condensed to 8 permanent matter particles/Higgs forces.
  - 24 particles 0%
    - X bosons or 12 transient superpartner forces and 12 associated Higgsinos expanded our universe during inflation.
  - 64 anti-particles (0%)
    - All anti-particles eliminated either by baryogenesis or inflation (12 anti-Higgsinos and their 12 associated superpartner forces)
  - 3 SM Force particles (graviton, gluon, photon) 0%
    - In transit photons contained radiation energies and assumed to be zero
      - Energy allocated to transmitting source and upon arrival to receiving sink
  - 6 atomic/subatomic matter 5%
    - Six permanent matter particles (up quark, down quark, electron, electron-neutrino, muon-neutrino, tau-neutrino)
  - 5 dark matter 26%
    - Zino, photino, and 3 permanent Higgsino types associated with 3 SM forces
  - 8 dark energy particles 69%
    - Eight Higgs forces associated with 8 permanent matter particles (up quark, down quark, electron, electron-neutrino, muon-neutrino, tau-neutrino, zino, and photino)

Super Universe

- Super Universe consisted of nested parallel precursor universes
  - Precursor universes consisted of nested parallel universes
  - Our universe nested in older precursor universe, latter nested in older Super Universe
- Super Universe modelled as a near infinitely large gumball machine
  - Our universe was one of the gumballs with radius of 46.5 billion ly
  - Parallel universes were other gumballs with different radii
  - A subset of the gumballs which included our universe was our precursor universe
  - Entire gumball machine was the Super Universe
- Universal laws of physics and structure assumed across Super Universe
  - Our universe was homogeneous and isotropic on a large scale (490 million ly cube)
  - Amplified requirements for our universe
    - Dark energy uniformly distributed
    - Center at doughnut physical singularity location
    - Spherical boundary with radius of 46.5 billion light years
  - As in our universe, Super Universe
    - Contained 129 matter/force particle types
    - 8 permanent matter/Higgs forces (dark energy)
    - Constant dark energy to total energy/mass percentage (69%)

Stellar Black Holes

- Stellar black hole theory amplified to include both a quark star (matter) and black hole (energy) because
  - A stellar black hole definition inconsistency existed
    - Stellar black hole contained a singularity having minimum area and volume
    - Same stellar black hole had maximum entropy implying maximum area or volume
  - Quark star (matter) had mass, volume, near zero temperature, permanence, and maximum entropy
  - Associated black hole (energy) had super force energy, a doughnut physical singularity (minimal volume), near infinite temperature, transientness, and minimal entropy
- Six types stellar black holes
  - Supermassive quark stars (matter) and quark stars (matter) in universes
    - Supermassive quark stars (matter) 10^6 to 10^{10} $M_\odot$ at centers of universe's 100 billion galaxies
  - Super supermassive quark stars (matter) and their associated super supermassive black holes (energy) in precursor universes which created universes
  - Super super supermassive quark stars (matter) and their associated super super supermassive black holes (energy) in Super Universe which created precursor universes
- In our precursor universe, a maximum entropy super supermassive quark star (matter) instantaneously evaporated, deflated, and collapsed to its associated minimum entropy super supermassive black hole (energy) creating our universe's "big bang" (white hole)

Einstein's General Relativity

- Friedmann, Lemaitre, Robertson, and Walker (FLRW) metric accepted solution
  - Solution describes two opposing forces which shape universes
  - Gravity/matter and anti-gravity/dark energy
  - Third force, radiation pressure ended at 380,000 years

- Friedmann's three scenario solutions
  - First scenario, matter and dark energy are in close balance
    - From a physical singularity, a universe expands at a decelerating rate until it reaches an inflection point and then expands at an accelerating rate
    - Our universe's scenario (inflection point 8 billion years)
    - Applies to most parallel universes because it is balanced and stable (10^{120} parallel universes)
  - Second scenario, matter overwhelms dark energy
    - From a physical singularity, a universe expands at a decelerating rate until it reaches a maximum radius and then contracts to another physical singularity (big crunch)
    - Our precursor universe's scenario where the super supermassive quark star (matter) evaporated, deflated, and gravitationally collapsed to a super supermassive black hole (energy)
    - Applies to a small percentage of parallel universes because of Second Law of Thermodynamics
  - Third scenario, dark energy overwhelms matter
    - From a nonzero radius, a universe expands at an ever increasing acceleration rate
   - Least understood scenario

Black Hole Entropy

- Entropy of black hole currently defined as $S_{BH} = \eta A/(l_p)^2$ η is a constant, A is event horizon area, and l_p is Planck length (Bekenstein-Hawking)

- Proposed entropy formula for quark star (matter) proportional to quark star's volume (r^3) and inversely proportional to Planck cube's volume $(l_p)^3$
  - Physicists intuitively believe entropy should be proportional to r^3

- Proposed entropy formula uses Boltzmann's equation $S = k \log \Omega$, where k is Boltzmann's constant, and Ω is the total number of different ways matter particle closed strings can arrange themselves
  - Quark star (matter) contains N matter particle Planck cube closed strings and a total of M Planck cubes containing matter particle or Higgs force closed strings
  - N and M are large and N<< M.
  - According to Dabholkar, total number of ways of distributing N matter particle closed strings each with a volume $(l_p)^3$ within a quark star (matter) of volume $V = (4\pi r^3/3)$ is
  - $S = k \log \Omega$ or
  - $\Omega = (1/N!)(V/(l_p)^3)^N$ where l_p equals Planck length or
  - $\Omega = (1/N!)(4\pi r^3/3(l_p)^3)^N$ where r is the quark star (matter) radius

- Proposed formula avoids Holographic Principle and its complications

Arrow of Time

- In our universe entropy increases irreversibly with time and provides a thermodynamic arrow of time - Second Law of Thermodynamics
  - Einstein's Theory of GR is time symmetric and contradicts Second Law of Thermo
  - Schwarzschild's GR solution - black hole, white hole, Einstein-Rosen bridge (i.e. wormhole or physical singularity)
- In subset volume of our universe, entropy decreased without negating our universe's Second Law of Thermodynamics
  - Our solar system's creation 4.6 billion years ago
    - Entropy decreased because life was created
    - Life synonymous - low entropy (available energy), death - high entropy (unavailable energy)
  - Our solar system was one of approximately 10^{22} stars in our universe
    - Solar system's entropy decrease didn't negate our universe's entropy increase of 10^{22} stars
    - Ratio of low entropy to high entropy stars estimated $> 10^{-22}$
- Similarly in subset volume of our precursor universe, entropy decreased without negating our precursor universe's Second Law of Thermodynamics
  - A maximum entropy super supermassive quark star (matter) evaporated, deflated, and collapsed to a minimum entropy super supermassive black hole (energy)
  - Dark energy reduction factor estimated $> 10^{-22}$
  - Ratio super supermassive quark star's (matter) volume/precursor universe's volume

Super Supermassive Quark Star (matter) Collapse to a Super Supermassive Black Hole (energy)

Radius << 10^{26} meters
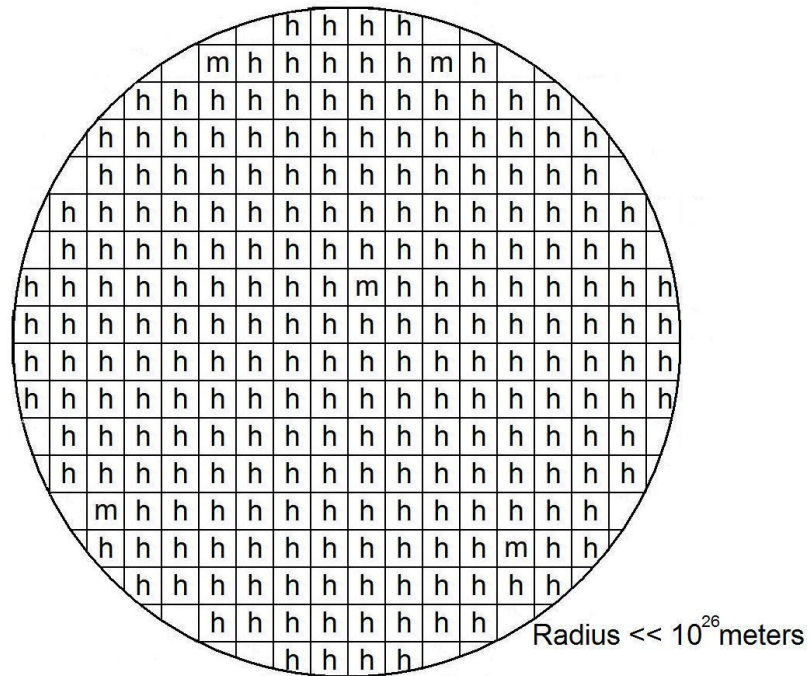
(a) Super supermassive quark star (matter) at t=-1 second
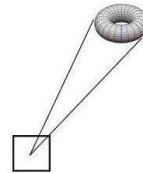
(b) Super supermassive black hole (energy) at t=0

Quark Star/Black Hole to Big Bang Transition
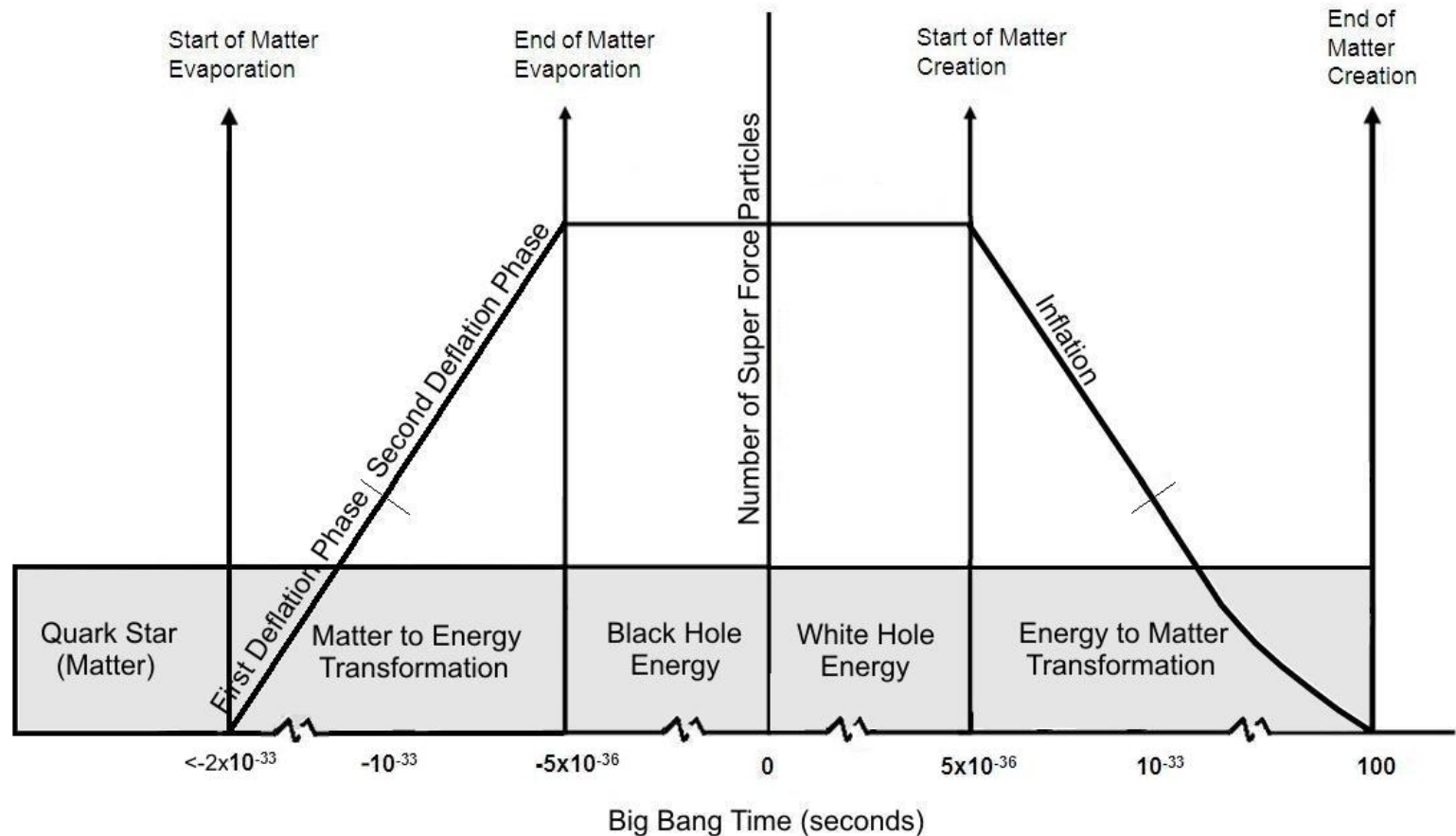
Ultimate Free Lunch Theory versus a Two-Step Integrated TOE

Law	The Ultimate Free Lunch theory	A Two-Step Integrated TOE
Conservation of Energy/Mass	violates	satisfies
Einstein's Theory of General Relativity	violates	satisfies
Second Law of Thermodynamics	satisfies	satisfies

Cosmological Constant Problem Overview

- Our universe nested in older precursor universe, latter nested in still older Super Universe
  - Nested universes provided dark energy reduction factor > 10^{-22}
    - Ratio super supermassive quark star's (matter) volume/precursor universe's volume
  - In our precursor universe t = 0, matter/dark energy uniformly distributed on large scale
    - Matter/dark energy not uniformly distributed on a small scale
    - On small scale volume, a super supermassive quark star (matter) evaporated, deflated, & collapsed to supermassive black hole (energy), and created our universe
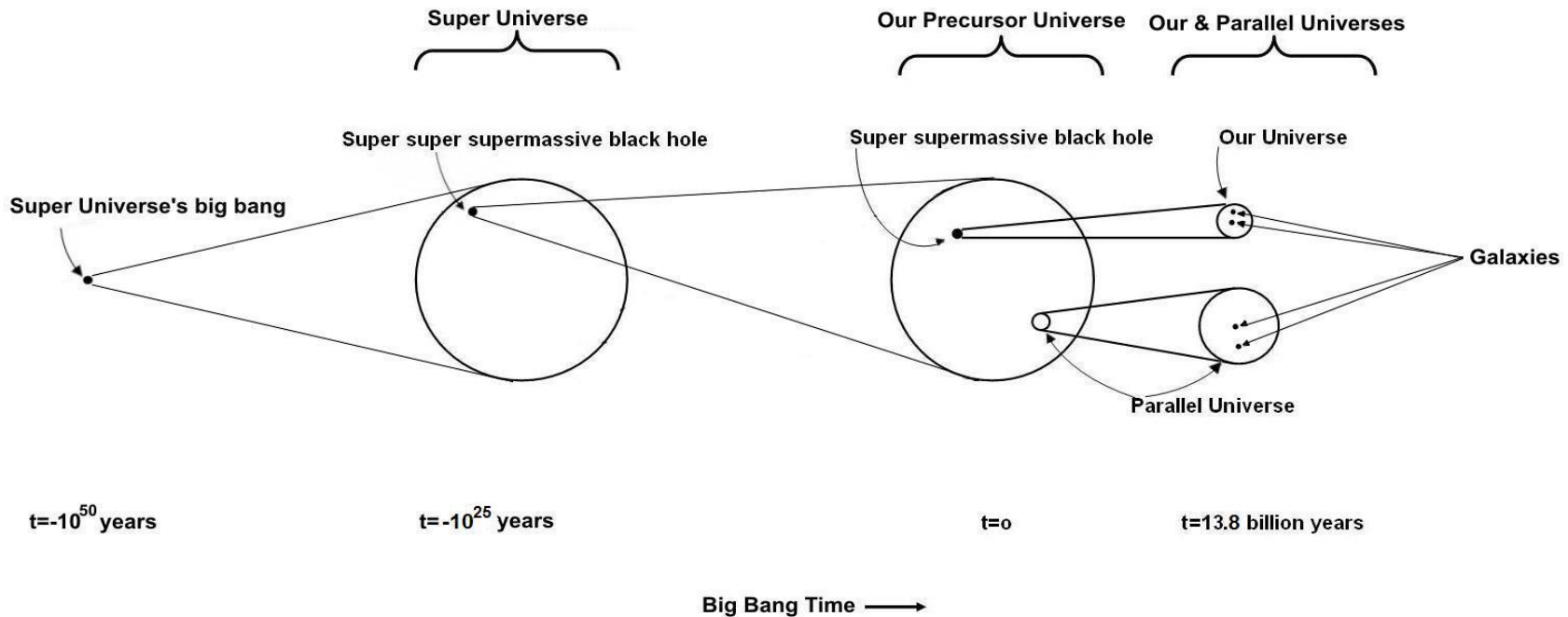- Cosmological constant problem - Super Universe's volume 10^{120} larger than our universe
  - Spherical volumes proportional to their radii cubed
  - Ratio of Super Universe's radius R_{su} to our universe's radius R_{ou} $(10^{120})^{1/3}$ or 10^{40} R_{su} = (10^{40}) $(46.5 \times 10^9$ ly) or approximately 10^{50} ly
  - Assuming equal expansion rates i.e. our universe's radius/our universe's age = Super Universe's radius/Super Universe's age, Super Universe's age approximately 10^{50} years
- Super Universe created by time sequential/concurrent cycles big bangs to stellar black holes
  - 4 time sequential precursor universes assumed between Super Universe/our universe
  - Dark energy reduction factor function of number of sequential precursor universes
- Hubble's law existed for precursor universes within the Super Universe, universes within our precursor universe, and galaxies within our universe
  - Hubble's law was not a constant
- Proof of Super Universe's parallel universes – NED – NASA/IPAC Extragalactic Database

Three Nested Universes at t = 0

Super Universe

Our Universe

Our Precursor Universe
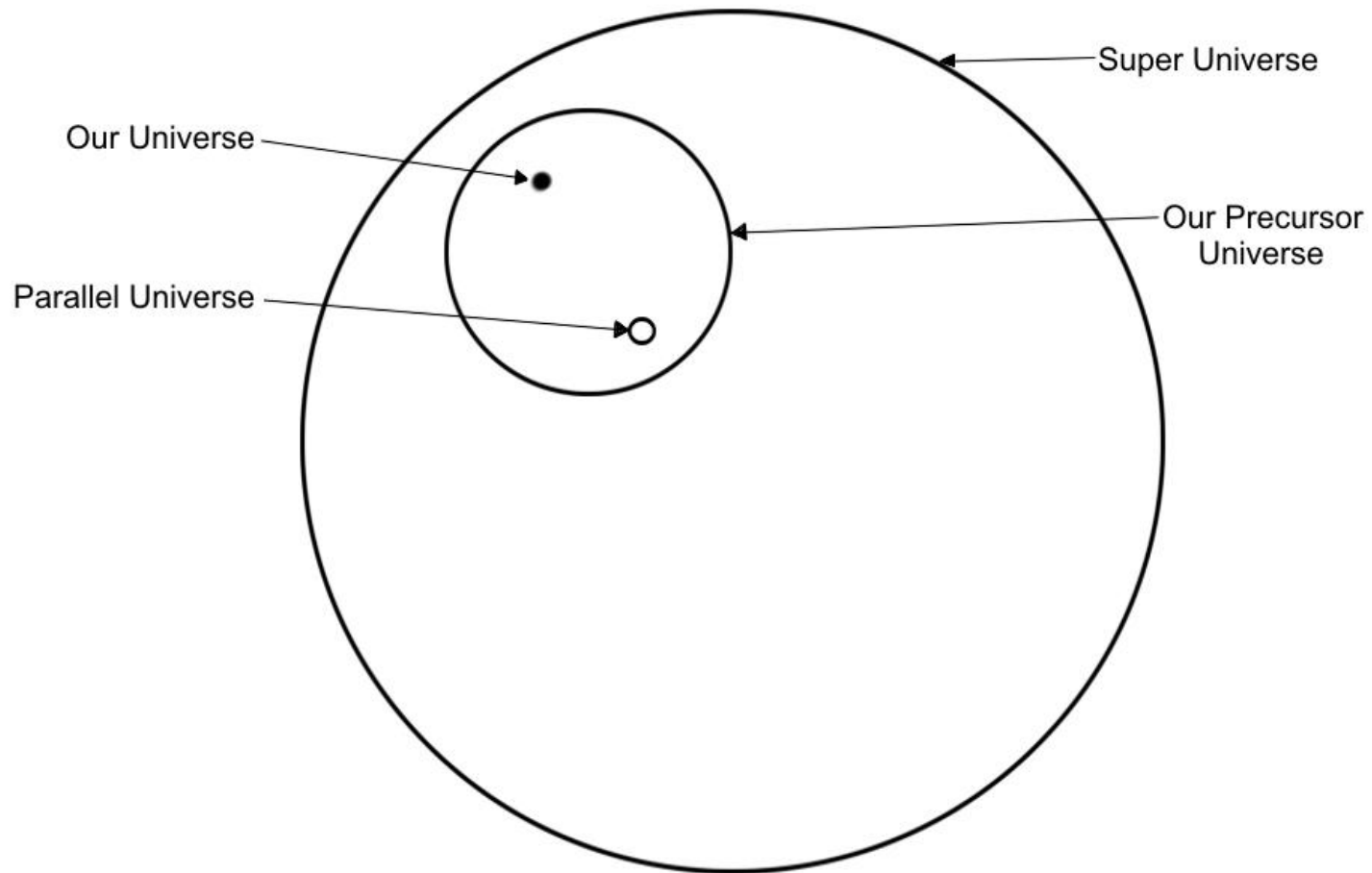
Parallel Universe

Time Sequential and Concurrent Cycles of Big Bangs through Stellar Black Holes

Super Universe

Our Precursor Universe   **Our & Parallel Universes**

Super super supermassive black hole

Super supermassive black hole   **Our Universe**

Super Universe's big bang

Galaxies

Parallel Universe

$t=-10^{50}$ years $t=-10^{25}$ years $t=0$ $t=13.8$ billion years

Big Bang Time $\longrightarrow$

Hubble's Law
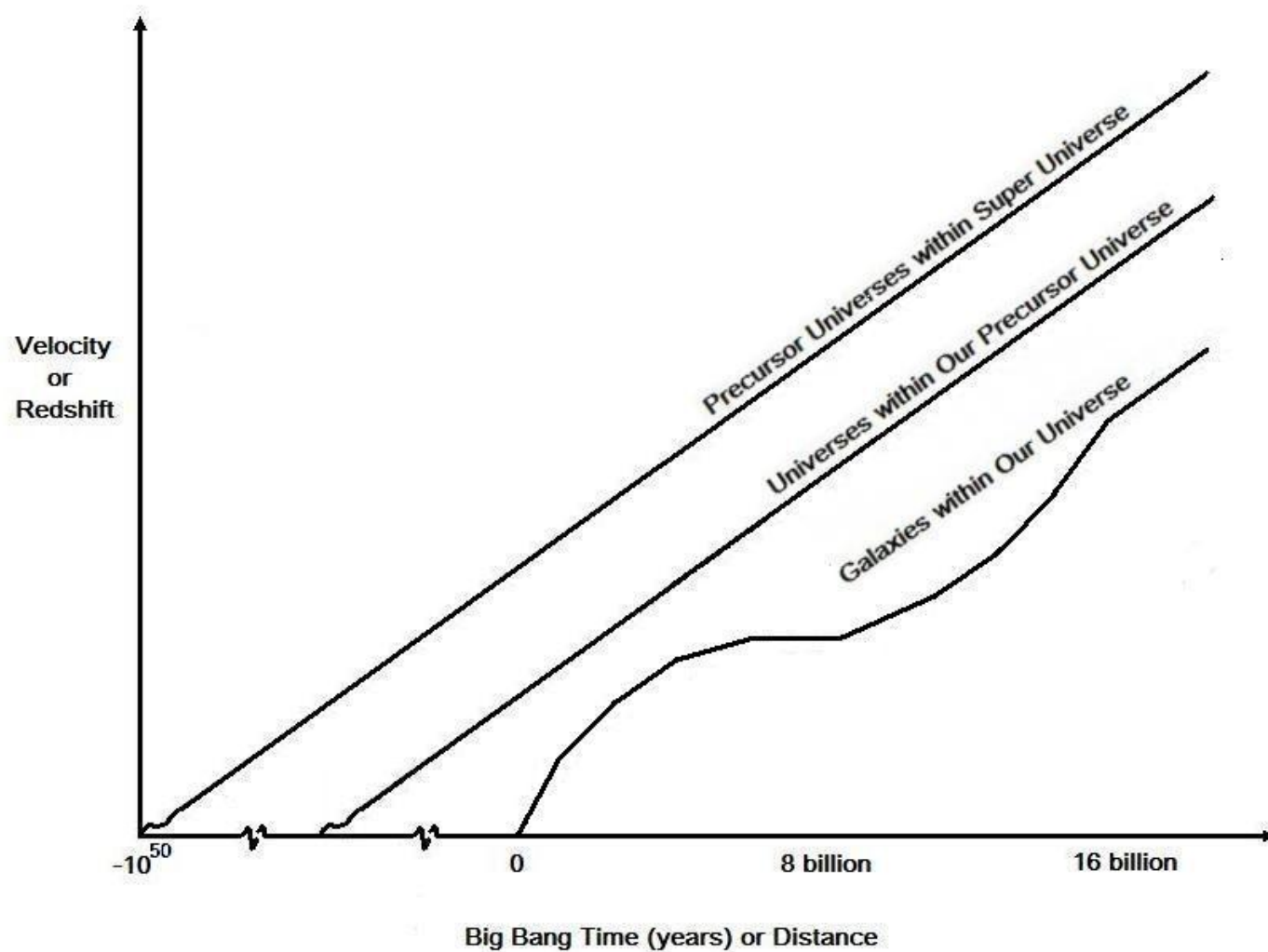
Four Nested Children Precursor Universes at t = 0

Super Universe

Our Universe

Parallel Universe

PU_1

PU_{1111}

PU_{111}

PU_{11}

PU_{1112}

PU_2

PU_{1113}

PU_{112}

PU_{113}

PU_{12}

PU_3

PU_{13}

PU_4

PU_6

PU_5
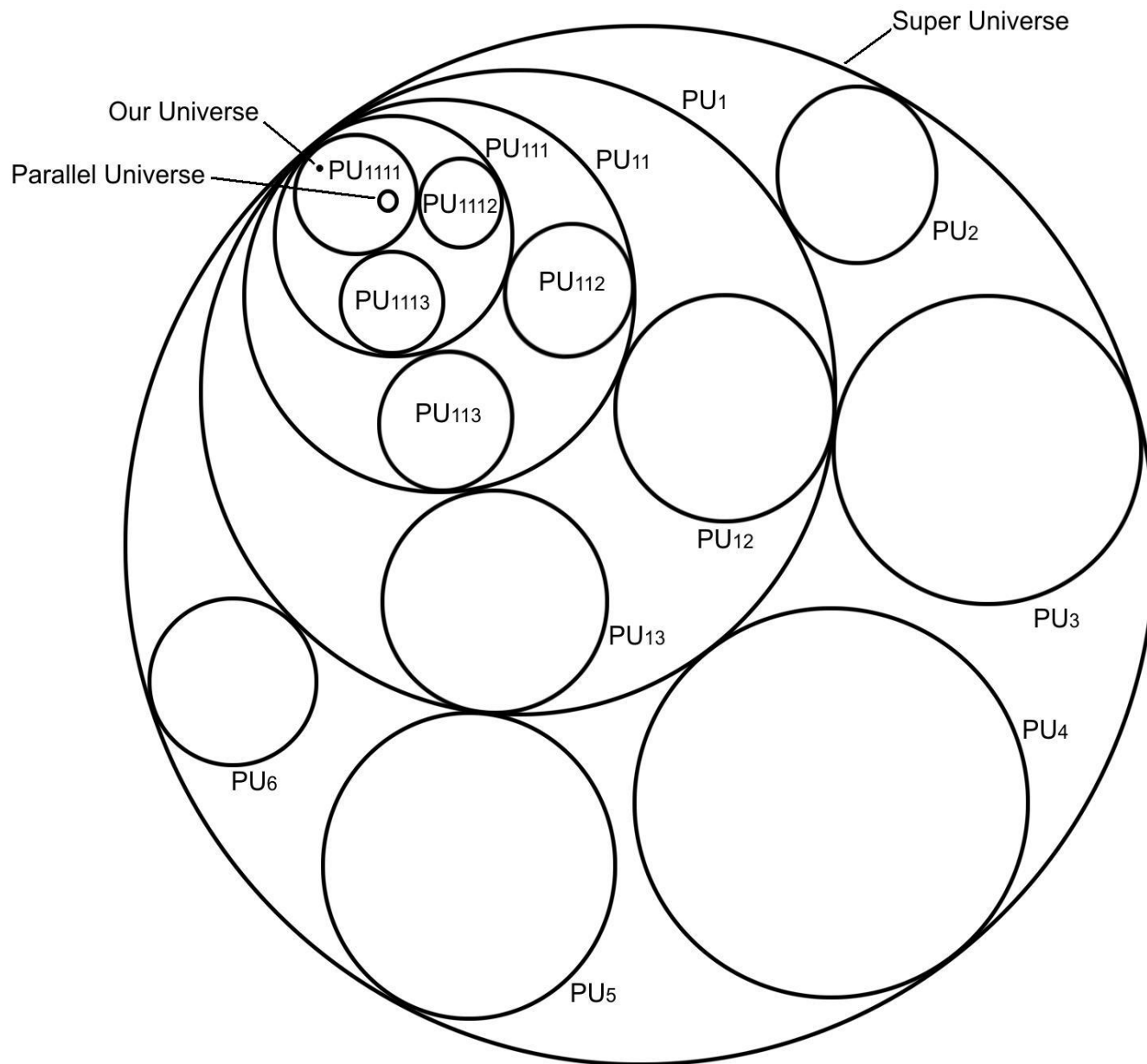
Proof of Parallel Universes

- Existing multi-wavelength and advanced gravitational observatory techniques
- NED – NASA/IPAC Extragalactic Database
  - Galaxies in our universe accelerating from our physical singularity origin
  - Galaxies of most parallel universes accelerating from their physical singularity origins
  - Parallel universes uniformly distributed between our universe's boundary (46.5 billion ly plus spherical shell) and Super Universe's boundary 10^{50} ly
    - Undefined zero-point energy spherical shell thickness (est. 2.2 billion ly) between our universe's outer boundary and our precursor universe's inner boundary
  - Across zero-point energy spherical shell is the closest galaxy of closest parallel universe to Milky Way galaxy
  - Milky Way and closest galaxy are accelerating toward each other
    - Received galaxy blue shifts from parallel universes may exist in NED
- Gravitational observatory
  - Estimated big bang gravitational energy waveform

Estimated Big Bang Gravitational Waveform
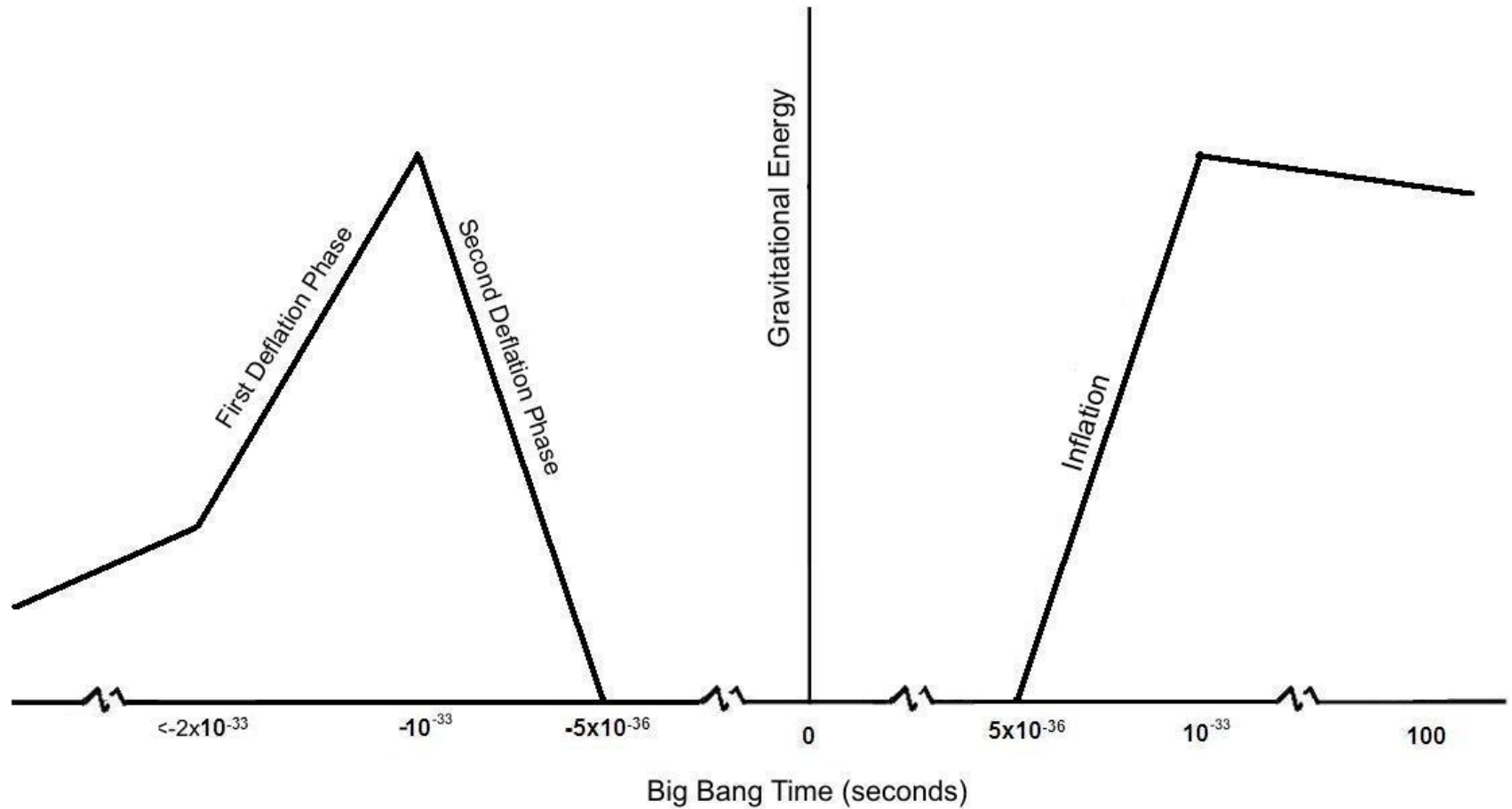
Black Hole Information Paradox

- In 1975, Hawking correctly stated Hawking radiation contained no information swallowed by a black hole
  - In 2004, he incorrectly stated Hawking radiation contained information
  - Black hole information paradox caused by misinterpretation of intrinsic and extrinsic information
- The "No Hair" theorem states a black hole (energy) has three information parameters
  - Mass, charge, and spin [Not applicable to associated quark star (matter)]
- In contrast to a black hole (energy), our universe contains near infinite information
  - Any universe object's (e.g. an encyclopedia) **intrinsic** information consists primarily of its unique relative orientation of up quarks, down quarks, and electrons to each other
    - Intrinsic information defines an object's molecular, atomic, nuclear, and fundamental matter (e.g. up quark) structure
  - In contrast, a universe object's (e.g. an encyclopedia) **extrinsic** information consists of words
    - Extrinsic information can be English, French, or binary coded words
    - Quark stars (matter) are "dumb" and can neither read nor store extrinsic information
- Encyclopedia intrinsic information is lost in four star collapse stages
  - In white dwarf star, molecules decompose to atoms and molecular structural information is lost
  - In neutron star, atoms decompose to neutrons, protons, and electrons and atomic structural information is lost
  - In a super supermassive quark star (matter), protons and neutrons decompose to up and down quarks and nuclear structural information is lost
  - In a super supermassive black hole (energy), up and down quarks decompose (evaporate) to super force particles and fundamental matter structural information is lost
- Hawking's 1974 solution is correct

Baryogenesis

- Charge, Parity, Time (CPT) violation caused baryogenesis
- Three CPT violation arguments supported each other and my article's conclusions
- First, the CPT theorem invalid at Planck scale (T. D. Lee)
  - Colella - a Planck cube defined the quantum of matter particle, force particle, and space
    - Our universe originated as a super force string doughnut physical singularity at center of a Planck cube
    - Quantum theory invalid before inflation - our universe's singularity was smaller than Planck cube quantum
  - Second, highly curved space-times violated CPT [e.g. a black hole (energy) singularity] (N. E. Mavromatos)
    - Mavromatos - In CPT theorem, laws of physics are unchanged by combined CPT operations provided locality, unitarity, and Lorentz invariance respected
      - Violations of unitarity caused by incoming matter information disappearance
    - Colella - Incoming matter information lost in collapse of super supermassive quark star (matter) to a super supermassive black hole (energy)
- Third, a quantum mechanics axiom stated transformation from one state to another respected unitarity and entropy preservation (F. Hulpke)
  - Colella - Maximum entropy super supermassive quark star (matter) evaporated, deflated, and gravitationally collapsed to minimum entropy super supermassive black hole (energy) and entropy was reset to a minimum
    - Energy/mass quanta in Planck cubes collapsed to a super force singularity smaller than a Planck cube quantum
    - During the collapse quantum theory invalid
- CPT, unitarity, and entropy preservation violated in the highly curved space-times
  - Our precursor universe's super supermassive black hole (energy)
  - Its symmetric big bang white hole (energy) counterpart
  - This provided sufficient CPT violations to produce our universe's baryon to photon ratio of 6.1×10^{-10}

Quantum Gravity

- String theory, a Two-Step Integrated TOE, and quantum gravity identical
  - Unify all known physical phenomena from near infinitely small Planck cube (quantum theory) to near infinitely large Super Universe (Einstein's General Relativity)
- String theory
  - Planck cube is quantum of matter, force, space - actions described by quantum theory
  - Each of 129 fundamental matter/force particle types is closed string in a Planck cube
  - Any object in Super Universe defined by volume of contiguous Planck cubes containing matter/force particle strings [e.g. super supermassive quark star (matter)]
- String theory unified quantum theory of near infinitely small Planck cubes (e.g. 129 fundamental matter/force particles) with Einstein's GR of the near infinitely large super supermassive quark star (matter)

A Two-Step Integrated TOE Mathematics Solution

- Two steps required for a Two-Step Integrated TOE
  - My fundamental physics step defined amplified requirements, answered all key physics questions
  - Subsequent two part mathematics step
- First part of the mathematics step
  - Amplified E8 Lie algebra technique for particles and interactions (Lisi)
  - Two-Step Integrated TOE amplified requirements added to Lisi's current E8 Lie algebra
    - 129 matter/force particle closed strings in Planck cubes; 64 super supersymmetric Higgs particles; spontaneous symmetry breaking gauge mediated and caused by high temperatures; cosmological constant proportional to dark energy density; etc.
- Second part of the mathematics step
  - Amplified N-body numerical simulation for cosmology (Vogelsberger)
    - Large scale ΛCDM model (Illustris simulation amplified with dark energy)
    - Two-Step Integrated TOE amplified requirements must be added (amplified Illustris)
      - Higgs forces created during matter creation; atomic/subatomic matter, dark matter, and dark energy uniformly distributed on large scale; gravity/matter and antigravity/dark energy forces shaped our universe; etc.
      - Predict galaxy positions and compare with measured positions instead of vice versa
- Intellectually formidable Two-Step Integrated TOE mathematics solution a work in progress
  - Lisi and Vogelsberger techniques should provide two part math step with my integration supervision

Table V. Primary interrelationships between 20 interrelated amplified theories

	String	Particle creation	Inflation	Higgs forces	Spontaneous symmetry breaking	Superpartner and SM decays	Neutrino oscillations	Dark matter	Universe expansions	Dark energy	Messenger particles	Relative strengths of forces	Super Universe	Stellar black holes	Black hole entropy	Arrow of time	Cosmological constant problem	Black hole information paradox	Baryogenesis	Quantum gravity
String	x	x							x				x	x						x
Particle creation	x	x	x	x	x	x	x	x	x	x		x		x	x			x	x	x
Inflation		x	x	x	x			x	x	x		x								x
Higgs forces		x	x	x	x	x		x	x	x	x					x			x	x
Spontaneous symmetry breaking		x	x	x	x	x	x	x	x	x									x	x
Superpartner and SM decays		x		x	x	x			x											x
Neutrino oscillations		x			x		x	x												x
Dark matter		x	x	x	x		x	x	x	x							x		x	x
Universe expansions	x	x	x	x	x	x		x	x	x		x								x
Dark energy		x	x	x	x			x	x	x				x	x		x	x	x	x
Messenger particles				x							x									x
Relative strengths of forces		x	x						x			x								x
Super Universe	x									x			x	x		x	x			x
Stellar black holes	x	x								x			x	x	x	x	x	x	x	x
Black hole entropy		x											x	x	x	x	x	x	x	x
Arrow of time			x							x			x	x	x	x	x	x	x	x
Cosmological constant problem						x				x			x	x	x	x	x			x
Black hole information paradox		x											x	x	x		x	x	x	x
Baryogenesis		x		x	x			x		x				x	x	x			x	x
Quantum gravity	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

38

Miscellaneous

- General Relativity/Quantum Theory applicability
  - General Relativity (GR) applicable all times (e.g., between t = 0 and t = 13.8 billion years)
  - Quantum theory applicable all times except between t = 0 and 5×10^{-36} s
    - At t = 0 s, our universe was a doughnut physical singularity at center of a Planck cube
    - At 5×10^{-36} s, our universe was a spherical physical singularity smaller than a Planck cube
    - Quantum theory not applicable when our universe smaller than a Planck cube quantum
- GR versus Newton's Law
  - Three star factor products defined our universe's volume (10^{-51}) containing stellar black holes
    - Stars were concentrated matter surrounded by large volumes of space (10^{-32})
    - A small fraction of stars were stellar black holes (10^{-3})
    - Stellar black holes were compressed stars (10^{-16})
  - Newton's Law applicable for most of our universe's volume provided expansion of space included. In sub-volumes containing stellar black holes, GR substituted for Newton's Law
- A mathematical singularity different than a physical singularity
  - Schwarzschild's radius in Einstein's equations, mathematical singularity (no physical significance)
  - Super supermassive black hole's (energy) doughnut physical singularity existed at Planck cube center
    - Contradicts Hawking's theory of no singularity at t = 0, and our universe had a quantum origin
  - Super supermassive black hole (energy) had physical singularity, its associated quark star (matter) did not

Miscellaneous (Cont.)

- Entanglement
  - Conservation laws - energy/mass, charge, and spin of our universe's physical singularity was distributed and directly related to energy/mass, charge, and spin of fundamental particles, atoms, stars, and galaxies in our universe
  - Indirect relationship between the energy/mass, charge, and spin of a particle in our universe with the energy/masses, charges, and spins of other particles in the first particle's immediate vicinity (locality principle)
    - Converted rest mass energy and radiation absorbed by surrounding particles
    - Action at a distance with velocities greater than light, violated Einstein's Special Theory of Relativity
    - Converted rest mass energy cannot affect a particle at opposite end of universe

Conclusions

- Hawking's single mathematics step TOE replaced by Two-Step Integrated TOE
- Because of intellectual formidability, Two-Step Integrated TOE or: integration of fundamental physics step described by this presentation, proposed E8 Lie algebra for particles math step, and proposed N-Body simulation for cosmology math step, remains work in progress.
- Six Two-Step Integrated TOE validation techniques
  - Large Hadron Collider (LHC) detection of all 64 Higgs particles
    - Two-Step Integrated TOE amplified Higgs particle requirements in LHC testing
  - Detection of hierarchy problem estimate of gravitino energy/mass, 10^{21} eV
  - Two-Step Integrated TOE amplified N-body numerical simulation
    - Galaxy position predicted and validated by galaxy measurements
  - Background Imaging of Cosmic Extragalactic Polarization (BICEP2)/Planck B-mode inflation polarization measurements
    - Measure exponential inflation factor and select one of three estimates (Guth 10^{53}, Colella 10^{36}, and Liddle/Lyle 10^{26})
  - Gravitational observatory (LIGO, LISA) detection of estimated big bang gravitational energy waveform 10^{33} Hz
  - NED – NASA/IPAC Extragalactic Database – existing data closest galaxy in closest universe
- Seventh validation technique - independent analyses/validations by physicists

Backup Slides

Standard Model/Supersymmetric Spins

Symbol	Standard Model Particle/Spin		Matter	Force	Symbol	Supersymmetric Particle/Spin		Matter	Force
p_1	graviton	2		x	p_{17}	gravitino	½?	x	
p_2	gluon	1		x	p_{18}	gluino	½	x	
p_3	top quark	½	x		p_{19}	stop squark	0		x
p_4	bottom quark	½	x		p_{20}	sbottom squark	0		x
p_5	tau	½	x		p_{21}	stau	0		x
p_6	charm quark	½	x		p_{22}	scharm squark	0		x
p_7	strange quark	½	x		p_{23}	sstrange squark	0		x
p_8	muon	½	x		p_{24}	smuon	0		x
p_9	tau-neutrino	½	x		p_{25}	stau-sneutrino	0		x
p_{10}	down quark	½	x		p_{26}	sdown squark	0		x
p_{11}	up quark	½	x		p_{27}	sup squark	0		x
p_{12}	electron	½	x		p_{28}	selectron	0		x
p_{13}	muon-neutrino	½	x		p_{29}	smuon-sneutrino	0		x
p_{14}	electron-neutrino	½	x		p_{30}	selectron-sneutrino	0		x
p_{15}	W/Z's (hybrid)	1		x	p_{31}	wino/zinos	½	x	
p_{16}	photon	1		x	p_{32}	photino	½	x	

Super Supersymmetry Spins

Symbol	Particle/Spin		Matter	Force	Symbol	Higgs Particle/Spin		Matter	Force
p_1	graviton	2		x	h_1	Higgsino	½?	x	
p_2	gluon	1		x	h_2	Higgsino	½	x	
p_3	top quark	½	x		h_3	Higgs force	0		x
p_4	bottom quark	½	x		h_4	Higgs force	0		x
p_5	tau	½	x		h_5	Higgs force	0		x
p_6	charm quark	½	x		h_6	Higgs force	0		x
p_7	strange quark	½	x		h_7	Higgs force	0		x
p_8	muon	½	x		h_8	Higgs force	0		x
p_9	tau-neutrino	½	x		h_9	Higgs force	0		x
p_{10}	down quark	½	x		h_{10}	Higgs force	0		x
p_{11}	up quark	½	x		h_{11}	Higgs force	0		x
p_{12}	electron	½	x		h_{12}	Higgs force	0		x
p_{13}	muon-neutrino	½	x		h_{13}	Higgs force	0		x
p_{14}	electron-neutrino	½	x		h_{14}	Higgs force	0		x
p_{15}	W/Z's (hybrid)	1	x		h_{15}	Higgs force	0?		x
p_{16}	photon	1		x	h_{16}	Higgsino	½	x	
p_{17}	gravitino	½	x		h_{17}	Higgs force	0		x
p_{18}	gluino	½	x		h_{18}	Higgs force	0		x
p_{19}	stop squark	0		x	h_{19}	Higgsino	½	x	
p_{20}	sbottom squark	0		x	h_{20}	Higgsino	½	x	
p_{21}	stau	0		x	h_{21}	Higgsino	½	x	
p_{22}	scharm squark	0		x	h_{22}	Higgsino	½	x	
p_{23}	sstrange squark	0		x	h_{23}	Higgsino	½	x	
p_{24}	smuon	0		x	h_{24}	Higgsino	½	x	
p_{25}	stau-sneutrino	0		x	h_{25}	Higgsino	½	x	
p_{26}	sdown squark	0		x	h_{26}	Higgsino	½	x	
p_{27}	sup squark	0		x	h_{27}	Higgsino	½	x	
p_{28}	selectron	0		x	h_{28}	Higgsino	½	x	
p_{29}	smuon-sneutrino	0		x	h_{29}	Higgsino	½	x	
p_{30}	selectron-sneutrino	0		x	h_{30}	Higgsino	½	x	
p_{31}	wino/zinos	½	x		h_{31}	Higgs force	0		x
p_{32}	photino	½	x		h_{32}	Higgs force	0		x
			17	15				15	17