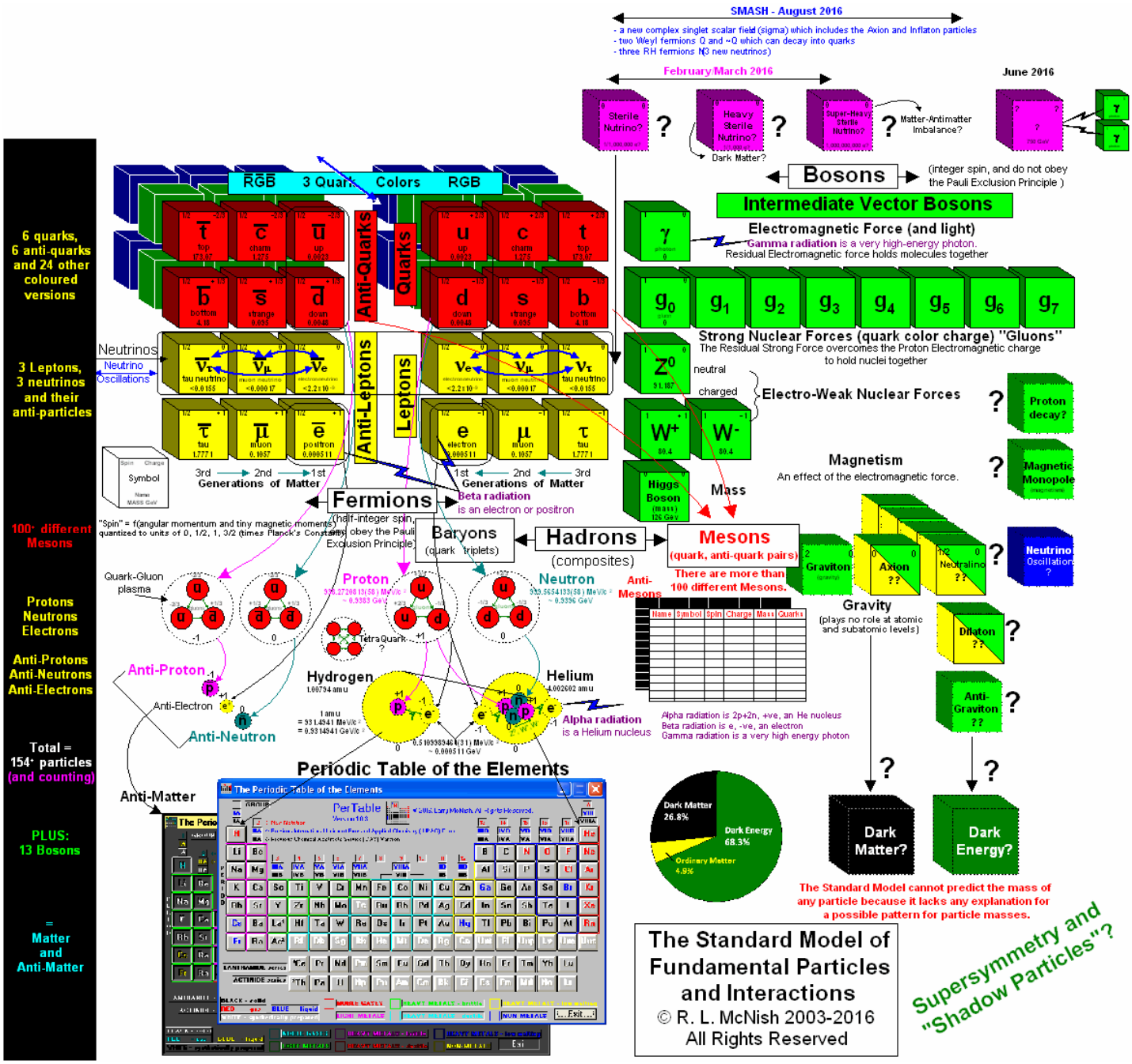
SMASH - August 2016
- a new complex singlet scalar field (sigma) which includes the Axion and Inflaton particles
- two Weyl fermions Q and ~Q which can decay into quarks
- three RH fermions N(3 new neutrinos)
February/March 2016
June 2016
Sterile Nutrino?
Heavy Sterile Nutrino?
Super-Heavy Sterile Nutrino?
Dark Matter?
Matter-Antimatter Imbalance?
Bosons
(integer spin, and do not obey the Pauli Exclusion Principle)
Intermediate Vector Bosons
Electromagnetic Force (and light)
Gamma radiation is a very high-energy photon.
Residual Electromagnetic force holds molecules together
Strong Nuclear Forces (quark color charge) "Gluons"
The Residual Strong Force overcomes the Proton Electromagnetic charge to hold nuclei together
neutral
charged
Electro-Weak Nuclear Forces
Proton decay?
Magnetism
An effect of the electromagnetic force.
Magnetic Monopole
Mass
Higgs Boson
6 quarks, 6 anti-quarks and 24 other coloured versions
3 Leptons, 3 neutrinos and their anti-particles
100+ different Mesons
Protons Neutrons Electrons
Anti-Protons Anti-Neutrons Anti-Electrons
Total = 154+ particles (and counting)
PLUS: 13 Bosons
= Matter and Anti-Matter
RGB̄ 3 Quark Colors RGB
Anti-Quarks
Quarks
Neutrinos
Neutrino Oscillations
Anti-Leptons
Leptons
3rd 2nd 1st Generations of Matter
1st 2nd 3rd Generations of Matter
Beta radiation is an electron or positron
Fermions
(half-integer spin, and obey the Pauli Exclusion Principle)
"Spin" = f(angular momentum and tiny magnetic moments) quantized to units of 0, 1/2, 1, 3/2 (times Planck's Constant)
Baryons
(quark triplets)
Hadrons
(composites)
Mesons
(quark, anti-quark pairs)
There are more than 100 different Mesons.
Anti-Mesons
Graviton
Axion ??
Neutralino ??
Neutrino Oscillation ?
Gravity
(plays no role at atomic and subatomic levels)
Dilaton ??
Anti-Graviton ??
Quark-Gluon plasma
Proton
Neutron
Tetra Quark ?
Anti-Proton
Anti-Electron
Anti-Neutron
Hydrogen
Helium
Alpha radiation is a Helium nucleus
Alpha radiation is 2p+2n, +ve, an He nucleus
Beta radiation is e, -ve, an electron
Gamma radiation is a very high energy photon
Periodic Table of the Elements
Anti-Matter
The Periodic Table of the Elements
Dark Matter 26.8%
Dark Energy 68.3%
Ordinary Matter 4.9%
Dark Matter?
Dark Energy?
The Standard Model cannot predict the mass of any particle because it lacks any explanation for a possible pattern for particle masses.
The Standard Model of Fundamental Particles and Interactions
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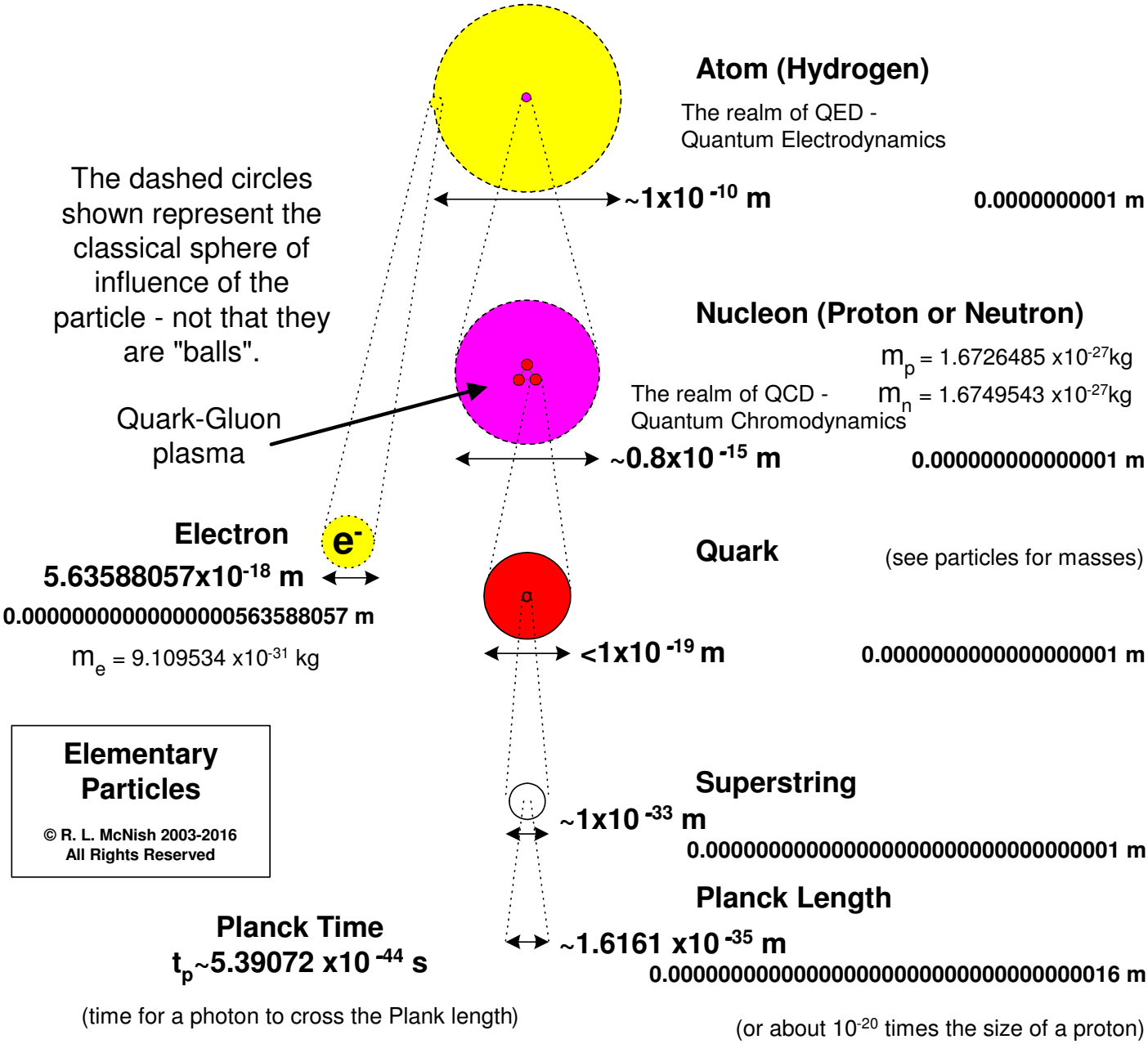
Supersymmetry and "Shadow Particles"?

Atomic and Quantum Dimensions