There Was a Monster at the Edge of the Universe. A Possible Link Between Cosmological Parameters, Dirac's Large Numbers and Group Theory.

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Abstract

The Monster group M is the largest of the only 26 existing sporadic groups, having order of about 8.08×10^53. The mass of the observable universe (baryonic matter plus dark matter) is estimated to be about 9×10^53 kg. The diameter of the observable universe is close to 8.8×10^26 m, which is almost the square root of the Monster group. As the observable universe expands, it expands from near 0 size to a diameter of about 63 billion ly (in limit). The surface area of the observable universe was about 8×10^53 m^2 near the midpoint of this expansion. An explanation of this observation is attempted via the observer effect. A possible link between cosmological parameters, Dirac's large numbers and sporadic groups is established.

Introduction

It would be easy to dismiss a single appearance of the Monster in the many cosmological parameters but not 3. The most obvious natural explanation is that there exists some kind of "Monster symmetry" in the current universe. But why now? If the universe expands as a result of the multiplication of the orders of the sporadic groups, most observers would observe a "Monster shell" because the Monster group is 20 orders of magnitude larger than the previous group - the Baby Monster.

What would be the final result of the multiplication of all the orders of the 26 sporadic groups? The resulting numerical value is 2.333×10^365. Such a large number is, at the first sight, hard to link to any specific property of the universe. After all, the final volume (in limit) of the universe will be only about 2×10^185 Planck volumes. But what if the Planck scale isn't the lowest allowed scale?

The universe sets a natural limit on the lowest energy/particle mass possible. This limit is linked to the Hubble radius, a single particle that has edges expanding faster than the speed of light, can not be a single particle. Thus the lowest energy floor at time t is given by the Hubble radius via the corresponding Compton wavelength. For example, the Hubble radius was about 16 billion light years long - approximately 7.5 billion years after the Big Bang (near the transient equilibrium). This Hubble radius equals to 1.51×10^26 meters and this is the Compton wavelength of a particle with mass of 1.46×10^-68 kg (8.19×10^-33 eV/c^2). This scale is 1.49×10^60 smaller than the Planck mass (scale). This sets a new minimal length as l_P/1.49×10^60 = 1.08×10^-95 m! And a minimal, fundamental volume of 1.26×10^-285 m^3.

How many fundamental volumes would fit into the universe at this time (transient equilibrium between decelerated and accelerated expansion)? The diameter of the observable universe at this point was about 37 billion light years, which leads to a diameter 3.5×10^26 meters and a volume of 1.8×10^80 m^3. This leads to 1.8×10^80/1.26×10^-285 = 1.43×10^365 fundamental volumes. This value is just about 1/2 of the product of all the sporadic groups. This is strong, albeit circumstantial evidence for the above mentioned hypothesis. It seems that the expansion of the observable universe is linked to the multiplication of the orders of the 26 sporadic groups.

Link to Dirac's Large Numbers

The square root of the numerical value 2.333×10^{365} is 4.83×10^{182} and this is somewhat close to the volume of the relatively early universe in Planck volumes. The 6^{th} root is 7.85×10^{60} and 9^{th} root is 3.95×10^{40}. These two values are very close to the values of Dirac's large numbers, suggesting a possible origin of Dirac's large numbers in the sporadic groups.

Link to Big Bang/Inflation

The geometric mean between 175560 and the product of all sporadic groups is 2.0×10^{185}, which if taken in Planck's volumes would create a sphere with radius or r = 62 billion light years, which is near the size of the observable universe (in limit, as time goes to infinity). It's possible that the smallest pariah - Janko group J_1 (order of 175560) is related to the Big Bang or to inflation.

The geometric mean between 7920 and the product of all sporadic groups is 4.3×10^{184}, which if taken in Planck's volumes would create a sphere with radius of r = 37 billion light years. This size corresponds to the size of the observable universe during the transient equilibrium as discussed above. It is possible that the smallest sporadic group - Mathieu group M_{11} (order of 7920) is related to the Big Bang or to inflation.

Conclusion

A possible link between cosmological parameters, the sporadic groups and Dirac's large numbers has been established.