Copious Tetraquarks: No True Hexaquarks – Indicators of E8 Symmetry in the Universe?

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Abstract: In a previous letter (see viXra 1408.0067) I have found that our universe has the broken symmetry E8 x U(1) and should contain exactly 248 types of quantum particles and that these have all been found. Included are 2-quark and 3-quark particles but no particle having 4 quarks or more. We do find one copious 4-quark particle and propose that it is a marker particle to alert us to the fact that the exalted 248 numeric goal has been attained. Studies by others indicate a 6-quark particle should be plentiful, but this has not materialized.

What happened at the time of the big bang is of great importance to us all and part of the story depends on a knowledge of what symmetry existed at that time and was behind the big bang. My study shows that before the bang the symmetry was unbroken E8 and after the bang it was broken to E8 x U(1). Early studies (most notably by Wilhelm Karl Joseph Killing about 1887[1]) showed that E8-type symmetries should all have 248 representations. In modern times we recognize this number to be given by the number of different bound particles existing in the universe.

In making the number determination one must be careful not to count excited quantum states as new particles – only ground states can be included. One 4-quark particle appears to meet the requirement and it is very copious[2]. A 6-quark particle is proposed as a candidate[3] but it has not been found to date. I propose that the single 4-quark particle is a marker generated by the E8 symmetry power itself to signify that the 248-particle limit has been reached. If the 6-quark particle or any other particle fails to materialize it will be a sign that E8 symmetry in some form governs our universe.

1. Ian Stewart, "Why Beauty is Truth – A History of Symmetry", pp. 165-171, Basic Books, (2007)

2. "The Dawn of the Tetraquark", Physicscentral, (2014)

3. P. Bicudo and G.M. Marques, "Theta plus (1540) as a heptaquark with the overlap of a pion, a kaon, and a nucleon", Phys. Rev. D 69, 011503(R)-(2004)