

Baryogenesis and its implications to fundamental physics

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How the imbalance between matter and anti-matter emerged in the big bang universe was a great conundrum until 30 years ago. Around that time a consistent theory of particle interaction has been established as the standard gauge theory. Prior to this time and already in mid 70's there have been speculations that the standard model based on $SU(3) \times SU(2) \times U(1)$ may be further unified into a larger gauge theory unifying all 3 interactions among quarks and leptons. It is in this atmosphere when lively discussions on speculative ideas of baryogenesis have been initiated. Since then, it has been a hot subject among theorists, and now many particle physicists regard the baryogenesis as one of the key issues to probe physics beyond the standard theory.

In this overview I shall review some general ideas and fundamental issues of baryogenesis. It is presented with some personal taste of historical perspective[1].

The emphasis of baryogenesis has shifted from the original GUT idea [2] towards a new one based on leptogenesis [3]. This is understandable in view of the experimental discovery of the neutrino oscillation. Some of the key elements of leptogenesis can be checked experimentally either by detection of neutrinoless double beta decay, or by some new idea. I shall thus touch on how this experimental vindication might become possible based on our new experimental method [4].

References

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