



Understanding the Universe: From Quarks to the Cosmos

Don Lincoln

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The Big Bang, the birth of the universe, was a singular event. All of the matter of the universe was concentrated at a single point, with temperatures so high that even the familiar protons and neutrons of atoms did not yet exist, but rather were replaced by a swirling maelstrom of energy, matter and antimatter. Exotic quarks and leptons flickered briefly into existence, before merging back into the energy sea.

This book explains the fascinating world of quarks and leptons and the forces that govern their behavior. Told from an experimental physicist's perspective, it forgoes mathematical complexity, using instead particularly accessible figures and apt analogies. In addition to the story of quarks and leptons, which are regarded as well-accepted fact, the author who is a leading researcher at the world's highest energy particle physics laboratory also discusses mysteries on both the experimental and theoretical frontier, before tying it all together with the exciting field of cosmology and indeed the birth of the universe itself.

The text spans the tiny world of the quark to the depths of the universe with exceptional clarity. The casual student of science will appreciate the careful distinction between what is known (quarks, leptons and antimatter), what is suspected (Higgs bosons, neutrino oscillations and the reason why the universe has so little antimatter) and what is merely dreamed (supersymmetry, superstrings and extra dimensions). Included is an unprecedented chapter explaining the accelerators and detectors of modern particle physics experiments. The chapter discussing the hunt for the Higgs boson, currently consuming the efforts of nearly 1000 physicists, lends drama that only big-stakes science can give. *Understanding the Universe* leaves the reader with a deep appreciation of the fascinating particle realm and just how much it determines the rich beauty of our universe.

Contents:

- Early History
- The Path to Knowledge (History of Particle Physics)
- Quarks and Leptons
- Forces: What Holds It All Together
- Hunting for the Higgs
- Accelerators and Detectors: Tools of the Trade
- Near Term Mysteries
- Exotic Physics (The Next Frontier)
- Recreating the Universe 10,000,000 Times a Second
- Epilogue: Why Do We Do It?

Readership: Students, scientists and lay people.

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