

Preface

The progress of Science has had its share of twists and turns, whether it be at the beginning of the nineteenth century or the beginning of the twentieth century, in more recent times. On these two occasions new ideas had to be invoked, indeed were forced upon us which led to a paradigm shift—the Atomic Theory and its consequences in the nineteenth century and Relativity and Quantum Theory in the twentieth century. After a century of dedicated and even frenetic work by some of the greatest minds in the world, it is now becoming apparent that we have reached yet another such turning point.

The attempts to provide a unified description of Quantum Theory and General Relativity or Gravitation have led to approaches like the String Theory and Derivative Theories. There has been impressive progress, particularly in String Theories over the past few decades. At the cosmic scale, the Standard Big Bang Cosmology had been perfected. A complete description of the Universe seemed to be falling into place.

This rosy picture was spoilt in the last years of the twentieth century. On the one hand, we were suddenly confronted with the realization that far from a decelerating Universe, being held back by Dark Matter, the Universe is actually accelerating, driven by Dark Energy. Indeed this had been predicted by the author in 1997 itself. At the micro scale, slowly the realization dawned that the various String Theories were leading to more and more exotic but unrealistic scenarios—our expectation of a Theory of Everything remained far from reality.

We would like to suggest that we are confronted with yet another paradigm shift. Rather than the reductionist approach which was at the heart of twentieth century physics, perhaps we have to invoke a Universe that is “Thermodynamic” in nature, in that fundamental properties result

from collective or cooperative phenomena. That is the theme of this book, which is based on some hundred papers written by the author over the past decade as also two books, “The Chaotic Universe: From the Planck to the Hubble Scale” published by Nova Science, New York and “The Universe of Fluctuations” published by Springer.

There are some satisfying features. Firstly, there is contact and agreement with experiment and observation. Indeed as Prof. Abdus Salam would say, “experiment is at the heart of physics”. Secondly, established conventional theories follow as suitable limiting cases of the present ideas. Furthermore, the ideas are simple and explain several phenomena at once whether it be a mass spectrum formula that gives the masses of all known elementary particles (and predicts others) or the deduction from theory of the supposedly miraculous, but empirical Large Number relations— and so on. This is very much in the spirit of science, finding a common denominator for the goings on in the Universe.

Following the suggestion of some important reviewers, the book has been written with a pedagogic flavour so as to be accessible to a larger audience of graduate and informed students. This has been done at the risk of being repetitive on the one hand, and on the other several simple references have been given.

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