Preface

One of the greatest achievements of twentieth century science is the unification of the microcosm with the macrocosm, i.e. the discovery of a close link between the world of subatomic particles and the Universe. This follows from the basic principles of quantum mechanics and relativity – the uncertainty principle and mass energy equivalence. These principles imply that when we probe deeper into the subatomic space we come across states of higher mass and energy. These are the states which abounded the Universe in its very early history, immediately after the Big Bang, when the energy density of the Universe was very high. In the last two decades, particle accelerator experiments have discovered the weak gauge bosons, which are the carriers of the weak nuclear force responsible for radioactive decay, and the top quark, which is the heaviest of the basic constituents of matter. These are very heavy and short-lived particles that abounded the Universe a few pico-seconds (trillionth of a second) after its creation. Recreating these particles in the laboratory is like recreating the Dinosaurs *a la* Jurassic Park but fundamentally more significant, for it helps us trace back the history of the Universe to within a few pico-seconds of its creation. Moreover one hopes to discover soon the other heavy particles predicted by the quantum field theory – i.e. the Higgs boson and the supersymmetric particles. They will help us understand the nature of the phase transition that the Universe went through during those first few pico-seconds and the nature of the invisible matter that pervades throughout the Universe today as a relic of that early history. But this is not the end of the story. One would like to retrace the history of the Universe right into the instant of the Big Bang and even beyond it, where the standard tool of quantum field theory breaks down. The recent developments in string theory offers us the first hope of addressing these issues.

Thus the interface of particle physics, string theory and cosmology is a highly active field of current research at the frontier of human knowledge. In recognition of this fact the PASCOS series of International Symposia was started in USA about a decade back. It brings together researchers from the three important and inter-related fields on a common platform to facilitate their mutual interaction and cross-fertilisation of ideas. The current symposium is the ninth one of this series, and the first one to be held outside USA. We are grateful to the International Co-ordination Committee of PASCOS for offering us to host the first offshore meeting of this prestigious series here in India. Of course that was before the infamous event of 9/11. The fear psychosis created by that event has taken its toll in overseas participation. Nonetheless we are glad to have had nearly a hundred participants from abroad and a slightly larger number from this country.

The scientific proceedings of the symposium consisted of about thirty plenary talks from leading experts in particle physics, string theory and cosmology. This was supplemented by four sets of parallel sessions for contributed papers in the areas of particle physics theory, particle physics experiment, string theory and cosmology. We have been able to obtain the written versions of almost all of the plenary talks with three notable exceptions, i.e. those of Profs G t'Hooft, J Silk and A Starobinsky. Similarly, we have been able to obtain practically all the parallel session presentations. We take this opportunity to thank the authors of both the

plenary and parallel session papers for timely submission of their manuscripts. We hope this proceedings will serve as a valuable resource book for the research workers in these fields.

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