*There are more things in heaven and in earth, Horatio,*
*than are dreamt of in your philosophy.*
[W. Shakespeare, Hamlet, Act 1, Sc. V, v.167–8]

# FOREWORD

The largest particle accelerator, LEP has just come into operation and the very first results set a stringent limit on the number of quark-lepton families through measurement of the number of light neutrino species. This limit was already widely discussed about 25 years ago, based on cosmological considerations, in connection with some of the possible explanations of the universe missing mass. In fact, the realisation, that the particle physics on the one hand and astrophysics on the other are intimately linked, is far from new, yet it is gaining strength with the progress made in both fields. The universe contains natural laboratories where the most varied conditions of temperature, density, magnetic field and radiation can be found. These conditions are far from being achieved in our terrestrial laboratories and probably they will not be reached in the near future. In parallel with the experimental progress towards the next energy (multi TeV) and luminosity ($10^{33}$–$10^{34}$) frontiers in particle physics, substantial effort is being devoted by the physics community towards experimentation at the highest energies with non-accelerator facilities. Indeed, it is in experiments at underground laboratories and in surface or space experiments, that energies and phenomena inaccessible to the largest imaginable particle accelerators may be investigated. Sources of cosmic radiation can, on the other hand, be studied entirely for their own interest. Nowadays, astronomers admit that physical processes occurring at very early times may determine many aspects of the universe which we observe today. Particle physicists think that the very early universe is a unique laboratory for elementary processes occurring at extremely high energies and that cosmological arguments based on these processes can provide severe constraints for their theories.

The situation is much less satisfactory from the experimental point of view. There is still a need for better understanding of the different ways of attacking the problem experimentalist level, where a gap is present between these two highly technical and utterly sophisticated disciplines and where better communication could help the spread of technical information with mutual benefits.

With these ideas in mind we organized the San Miniato Topical Seminar on Astrophysics and Particle Physics which took place in May 1989 in the Conference Centre "I Cappuccini" of the Cassa di Risparmio di San Miniato. The main areas covered by the Seminar have been the subject of recent exciting developments of great importance to both disciplines:

- propagation and acceleration of cosmic rays,
- progress with gamma-ray astronomy,
- search for point sources of radiation,
- supernovae and collapsed objects, including SN1987A,
- dark matter and antimatter from other galaxies.

A large fraction of the programme was dedicated to the presentation and the discussion of present and future experimental facilities.

The meeting brought together astrophysicists and particle physicists with the aim of improving communication, exchanging information and holding discussions on problems of common interest. It was attended by about 70 physicists, representing more than 40 laboratories and 12 different countries.

The Seminar was sponsored and supported by the Italian Institute for Nuclear Physics (INFN) together with the Universities of Bologna and Florence, by the Regione Toscana and by the Cassa di Risparmio di San Miniato.

We would like to thank all the sponsoring institutions who rendered the meeting possible and in particular Prof. N. Cabibbo, President of the INFN, Prof. E. Verondini, Director of the Physics Department of the University of Bologna, Prof. N. Taccetti, Director of the Physics Department of the University of Florence, Mr. G. Bartolini, President of the Regione Toscana, and Cav. L. Catastini, President of the Cassa di Risparmio di San Miniato. We would like to thank most warmly the secretaries of the meeting and all the people who helped us with the organization and during the meeting, in particular Ms. M. Boldini, M. Keller and Mr. S. Zagato.

The program was constructed around main lectures followed by shorter talks, leaving in addition ample time for the discussions: our final thanks go therefore to all the speakers for the quality of their contributions and to all the participants for their enthusiasm which greatly contributed to the success of the meeting.

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