

Introduction

The laws of nature require us to perform experiments at higher and higher energies if we are to probe the structure of matter at smaller distances, or test the action of the forces of nature over more minute intervals of space and time. Paradoxically as we focus deeper into these mysteries the size of the "microscope" needed has become larger and larger, from bench-top dimensions to rings which can encircle a major city.

This volume contains papers presented at a meeting held at New College, Oxford from September 27th to September 30th 1982, to consider new ideas for achieving higher energies. The title of the meeting, organised jointly by the European Committee for Future Accelerators and the Rutherford Appleton Laboratory, was "The Challenge of Ultra-High Energies", and the aim was summarized in the poster announcing the meeting as follows:

"Existing accelerator techniques are approaching a limit set by size and cost. The meeting will examine these limits and enquire whether there are any approaches which offer a promise of reaching energies far beyond the present horizon. The aim is to inform non-specialist high-energy and accelerator physicists".

The choice of the Long Room of New College to hold the meeting helped to give a sense of perspective to the discussions. The Long Room is one of the early buildings of a College which was 'New' in 1379, about a century before Columbus stumbled upon the 'New World'; here the participants were encouraged to debate ideas which might, with some optimism, mature after a quarter of a century or so into the next-but-one generation of high energy accelerators.

A wide variety of approaches to particle acceleration were described, some already well explored and a few novel ones. There was a great deal of lively discussion, but no heated controversy or strong polarisation of views. The editors have done their best to produce an acceptable version of the discussion. This has involved some paraphrasing, and some omission of material which was repetitive or obscure; we apologise if any important material has been lost in this process, or any speaker has been misrepresented.

The principle motive for this meeting was to review some of the current ideas on particle acceleration for a European audience and so hope to stimulate an increased awareness in our laboratories and universities not only of the need to seek new methods of particle acceleration, but also of the very challenging physics underlying many of these ideas, and which may well have other interesting applications. We hope these proceedings will help to build bridges between the several frontiers of technology involved, provoke new ideas for experiments, and encourage support for these ventures from the high-energy-physics community - it is our future!

Acknowledgements

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We are all grateful to New College for the excellent hospitality we received in such majestic surroundings, and also to the Lydian Quartet who delighted us with their music one evening in the Old Library.

J.H. Mulvey
Chairman of ECFA.