

## INTRODUCTION

For almost twenty years, a large fraction of my research activity has been focused on the phenomenological analyses of some high-energy processes which have helped us a great deal in collecting evidence for the quark structure of matter. Understanding the quark structure of matter has been one of the most important advances in contemporary physics. It has unravelled a new deeper level of structure in matter, and physics at that level reveals a unity and aesthetic simplicity never before attained. All forces emerge from a unique invariance principle and each of the basic interactions results from a specific symmetry property. Quarks interact among themselves through their "colour," as now accurately described by quantum chromodynamics.

"The quark structure of matter" was actually the title chosen for a topical meeting in the Rhine valley, which I was glad to organize with H. Meyer as the first joint topical meeting of the French and German Physical Societies, when I was president of the former. This was in 1985. The proceedings were published by World Scientific. It is a very great pleasure for me to now respond to the invitation of World Scientific to publish a reprint volume of some of my review articles on that subject. They illustrate the progress made in the understanding of this new deeper level in the structure of matter. They also illustrate what phenomenology is — theoretical physics conducted in close contact with experiment. I am indeed much indebted to many experimental colleagues at CERN, Fermilab, Brookhaven and SLAC, for the numerous discussions that I have had with them in the course of this research. Indeed, over half of the "ISR discussion meetings" between experimentalists and theorists, which we have had at CERN from 1972 to 1982 had to do with the understanding of the large  $p_t$  phenomena which eventually provided evidence for jets and their origin with quark scattering. It is a great satisfaction that the ideas and predictions which I could formulate with my collaborators have been of some use. Phenomenology is indeed a long, down to earth, interplay between theoretical models and experimental results. In considering the quark structure of matter, the story is already rich and long and my contributions refer to only some parts of it.

This volume, which brings together eight review articles, is actually mainly about hadronic jets. We do not "see" quarks but observe, instead, spectacular jets of hadrons which, to a good approximation, altogether carry the energy, momentum and quantum number of the quarks which were *a priori* expected to be ejected in a high-energy collision, as constituents should some of the time. Such jets have therefore come to play a prominent role in unravelling the quark structure of matter. However, securing solid and compelling evidence for the mere presence of jets, in the first place, required a long interplay between theoretical and experimental analysis lasting for about ten years! And this was only one facet of the analysis of the quark structure of matter. Before turning to the actual presentation of this reprint volume, a more general historical survey of this whole field of research should therefore be worthwhile.