Plenary
Nucleon structure and QCD

Jiro KODAIRA

Dept. of Physics, Hiroshima University, Higashi-Hiroshima 739-8526, JAPAN

The nucleon structure which appears in high energy processes has been studied for long time based on QCD. The basic theoretical framework to investigate the nucleon structure is now the "Factorization Theorem" in QCD. This enables us to isolate the perturbatively calculable parts and eventually to identify the non-perturbative objects inside nucleons. In high energy processes, nucleon can be described as an assembly of partons (quarks and gluons). Therefore, it is interesting and essential to know how partons distribute inside the nucleon. This subject is important not only to understand the nucleon itself but also to obtain some clue to new physics beyond the Standard Model from various experimental data.

In spite of the cerebrated theorem of factorization, the non-perturbative parts can be determined only by experiments or some non-perturbative method like the lattice QCD. For the spin independent processes, many experiments performed so far help us to determine the parton distributions and we have succeeded to have the common understanding on the nucleon structure except the "edge regions of phase space". For the spin dependent structure of nucleon, however, our understanding is quite poor and many questions remain unanswered. Therefore, to understand the spin structure of nucleon is an urgent task today. Furthermore, the spin dependent quantity is, in general, expected to be very sensitive to the structure of interactions among particles. These are the reasons for recent huge activities in high energy spin physics.

In this review talk, I will put an emphasis on the theoretical aspects in this field. Due to the limitation of allocated time, recent progress on the experiments and phenomenological analyses will not be touched. I explain the present status of the theoretical analyses with some "cautions" when applying the perturbative QCD to the high energy processes. I would like to emphasize the importance of the next-to-leading order calculations and the resummations of the perturbative series to identify correctly the non-perturbative parts. After these general remarks, I will single out only a few topics which seem particularly interesting and important to obtain new information on nucleon structure in conjunction with experimental data and planned new experiments.