Proceedings of the Workshop on

MESONIC DEGREES OF FREEDOM IN HADRONS

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Workshop on

MESONIC DEGREES OF FREEDOM IN HADRONS

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PREFACE

Although quantum chromodynamics is widely accepted as the theory of strong interactions, the understanding of this theory at the hadron level is still an open problem. Therefore, much research relies on models using effective fields instead of, or in addition to, the quark and gluon fields. These effective fields mimic the nonperturbative effects of QCD and try to emphasise the symmetries of QCD, in particular the chiral symmetry. The symmetries have helped to understand the link between models with valence quarks, hybrid models and pure topological models.

The variety of models and the activity in producing quantitative results require a continual discussion among physicists working in these fields in order to review critically new achievements, to confront different opinions, to exchange new ideas, to set up new problems for the future, and, last but not least, to strengthen further friendly contacts. We took the advantage of a Workshop with a small group of participants where discussions can be very open and critical and every participant can bring up his problem. We think that the Workshop succeeded in this respect and that several ideas which matured during the discussion will be reflected in future publications.

To give a personal view of the discussions, we should first note the important role of QCD as a guide in deriving models. The effective fields have, however, only been related to QCD and much work is needed to continue the attempts to derive them from first principle.

Since too many models and their versions are on the market, it is desirable to eliminate some by crucial tests. One should explore their limitations in terms of relevant physical properties and honestly state successful results as well as failures. Some such tests were presented at this Workshop and appear in the Proceedings: the static properties of the baryons, the baryon-baryon and baryon-antibaryon system, nuclear matter in extreme conditions. The comparison of different models is still very incomplete. Furthermore, though we understand the present models as effective models, it is meaningful to investigate their consistency, e.g. to study the stability of the vacuum.

Another important extension and test of present models is to include strangeness. Weak interactions also offer relevant insights. Besides, we learned that approaches which we discussed can be applied to other fields, e.g. to the standard model of weak interaction and to the study of substructure.

Some open problem which we discussed are not included in the Proceedings. Let us state a few which might provoke discussions in future workshops: What are the the limits of validity of the semiclassical quantization and the quantization which interprets the classical solution as a coherent state? How can we go beyond these quantization schemes? Can Skyrmions be represented by a coherent state without spoiling their topological properties; would this enable a quantum projection of good spin and isospin? Is the number of pions (e.g. in the ground state of the nucleon) just a theoretical concept or can one "measure" it? Can the number of virtual pions be determined from the processes $e + p \rightarrow e + n + \pi$ or $\pi + p \rightarrow \pi + \pi + N$? How can we extend soliton models to nuclear matter; is it legitimate to neglect nucleon kinetic energies and use a crystal or Wigner-Seitz cell?

We would like to thank the participants for creating the lively, stimulating and friendly atmosphere during the Workshop. We also thank the authors for the carefully prepared manuscripts.

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