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The Many-Body Problem Jastrow Correlations Versus Brueckner Theory

Proceedings of the Third Topical School
Held in Granada (Spain)
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PREFACE

This volume contains the Proceedings of the Third Topical School "The Many-Body Problem: Jastrow Correlations Versus Brueckner Theory" held in Granada, Spain, September 22 to 27, 1980. Both approaches to the understanding of many-particle systems are by now around 25 years old, and they have had a fruitful past, and have an active present and a promising future. The School was planned to be at the level of advanced graduate students or recent Ph.D.'s. Actually, the attendance covered a wider range, including very experienced people.

The core of the School were four series of four lectures, each covering the more fundamental aspects. The first part of the week was devoted to infinite fermionic systems (mainly nuclear matter). The lectures of Prof. Rosati are a review and generalization of the FHNC theory, with applications to polarized Fermi systems with state-independent correlations and to unpolarized Fermi systems with state-dependent correlations. On the other hand, Prof. Mahaux dealt with the fundamentals of Brueckner theory and some of its variants, with a particular emphasis on the physical grounds. An appealing characteristic of these series of lectures was the overlap in their discussions of physical applications, which offered an up-to-date comparison of the properties of infinite fermionic systems from the variational and the perturbative points of view.

The second part of the week was devoted to finite nuclei. Prof. Faessler discussed in his lectures recent applications of Brueckner theory: heavy-ion reactions and pion condensation. On the last topic a careful analysis of the role of Δ isobars and ρ meson exchange was presented. The variational counterpart of this half of the School was provided by Prof. Clark's lectures, in which different cluster expansion algorithms were reviewed and the method of correlated basis functions was thoroughly studied, including some recent advances like the correlated RPA.

In addition to the main lectures there was a wide spectrum of Seminars on specialized topics. The N-N interaction was considered from two different points of view: the OPE tail was used in Dr. Martorell's seminar to get bounds on the D-wave parameters of the deuteron. Dr. Müther discussed the effect of nucleon isobars on the three-body forces in nuclei.

Variational calculations in infinite fermionic systems were again considered in two seminars: Dr. Fantoni studied neutron and nuclear matter within the Jastrow approach with BCS model wave functions. Liquid

^{3}He was considered in Dr. Kürten's contribution using σ_z-dependent correlation factor. The FAHT cluster expansion was the subject of two other seminars: its use for calculating nondiagonal matrix elements in CBF theory (Dr. Guardiola) and an heurestic treatment of its convergence properties via Padé approximants (Dr. Ros). Dr. Poves gave his seminar on three-body effective interactions induced by high-dimensionality shell model calculations, and Dr. Schütte presented a field-theoretical model for a many-body theory.

Finally, the seminar presented by Prof. Clark "Brueckner Theory with Jastrow Wave Functions" may give an indication of the fruitfulness of the School, providing a bridge between Brueckner and Jastrow approaches.

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R. Guardiola, J. Ros

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