Atomic and Nuclear Physics

NEW MODELS FOR SUPERSYMMETRIC QUANTUM MECHANICS, D. Meltzer[1], M. Berger*[2], Stony Brook University[1], Department of Physics and Astronomy, Stony Brook, NY 11794, Indiana University[2], Department of Physics, Bloomington, IN. 47405, berger@indiana.edu

Supersymmetry has a long history of simplifying questions and revealing connections in various fields of physics and mathematics. Supersymmetric Quantum Mechanics (SUSY QM) allows for the construction of isospectral Hamiltonians and systems with identical reflection and transmission properties. The algebra of SUSY QM is generalized by allowing for multiple supercharges that individually generate the N=2 SUSY algebra and considering the sum of their respective Hamiltonians. That is, the total Hamiltonian is a sum of factorized Hamiltonians. The isospectrality relation between partner Hamiltonians is no longer trivial and constraints are imposed on the form of the potentials. In turn, the conditions for the existence of a zero-energy ground state wave function are derived and the explicit form of the wave function is given. A new operator corresponding to mixed supersymmetry transformation naturally appears in the algebra and generates a central charge when isospectrality is enforced. The intertwining operator, which is normally determined by the supercharge operator, is also generalized to allow for a better understanding of the previous constraints. Finally, a third algebra is considered where a complex supercharge and its Hermitian conjugate separately square to the Hamiltonian. This allows for a new connection between the N=1 and N=2 algebras and can be naturally translated into the superspace formalism.

D. Meltzer was supported by NSF-REU grant Phy-1156540