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Molecular interactions in and with fields: thermal collisions, ultracold gases, supersymmetry¹

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The work to be presented in this talk is chiefly concerned with developing new techniques to manipulate molecular states and interactions by means of static and radiative fields. The talk will describe a simple analytic model to rationalize molecular collisions, both field-free and in fields; techniques to fine-tune and probe weakly-bound molecular states and to enhance the photoassociation rate of ultracold atoms with far-off-resonant light; the use of supersymmetric quantum mechanics to find exact solutions to the eigenproblem of molecules subject to a particular combination of fields; new types of intermolecular potentials shaped by far-off-resonant light. Of relevance to ongoing experiments, this work offers insights into few-body AMO physics and may induce the study of many-body effects it anticipates in the collective behavior of ultracold gases.

¹This work was performed at the Fritz Haber Institute of the Max Planck Society (Berlin, Germany), under the supervision of Prof. Dr. Bretislav Friedrich.