



# Old Dominion University Department of Physics

Colloquium  
Tuesday, September 8, 2015

"Shedding Light on Few-Body Quantum Dynamics by  
Studying Atomic Collisions"

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**York University**

Abstract: The quantum-mechanical few-body problem has challenged physicists ever since the foundations of quantum theory were laid in the 1920ies. Collisions of atoms, molecules, and their ions are particularly interesting realizations of this problem, because the interaction potentials are well known and the question of how to deal with the few-body character of the collision system under study is the only fundamental difficulty for theory. Given the abundance of available experimental data and the importance of understanding them not just for fundamental but also for applied reasons, there is considerable motivation to address this difficulty.

In my talk, I will outline a time-dependent quantum-mechanical approach based on the concepts of density functional theory, which we have developed over the years to describe nonrelativistic heavy-particle collisions from atoms and molecules. Recent results for helium and lithium atom as well as for water and methane molecule targets will be presented. Depending on the process under study the few-body problem presents itself as a more or less intricate one. I will discuss situations which reflect single-active-electron dynamics, independent-electron dynamics and more complicated, i.e., correlated, electron dynamics.

Presentation: **OCNPS 200 @ 3:00 pm**  
Refreshments: **OCNPS Atrium @ 2:30 pm**

**All interested persons are cordially invited to attend.**