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Low-energy electron interactions with biomolecules[1]

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Low-energy electron interactions with biomolecules have been the focus of sustained attention over the past decade. The demonstration by Sanche and coworkers that even subexcitation and subionization electrons can induce strand breaks in DNA opened a new frontier in understanding radiation damage to living systems. Many studies of DNA subunits and their analogues, both experimental and theoretical, have elucidated likely mechanisms by which slow electrons attach to and disrupt DNA, although the full picture is far from clear and some elements of it remain controversial. Increasing attention is also being given to low-energy electron collisions with amino acids in order to explore possible mechanisms of electron-mediated radiation damage to proteins. In a completely different context, electron-biomolecule collisions are fundamental to spark ignition and cumbustion of biofuels such as methanol and ethanol. Not to be overlooked, either, is the simplest but most ubiquitous biomolecule of all, water, whose low-energy electron cross sections remain surprisingly ill-characterized. This talk will survery recent *ab initio* computational studies using the Schwinger multichannel method of DNA- and protein-related molecules, alcohols, and water. Much of the work to be presented was carried out in collaboration with experimentalists who undertook complementary measurements, allowing for useful comparisons to be made. Although the primary focus will be on electronically elastic collisions relevant to dissociative attachment and electron transport, electron-impact excitation cross sections for water will be presented and discussed.

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