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**A contemporary theoretical view of ion-atom, -molecule interactions<sup>1</sup>**

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Energetic interactions among electrons, ions, atoms, and molecules within gaseous, plasma, and even material environments are fundamental to such diverse phenomena as low temperature plasma processing of semiconductors, collapsing giant molecular clouds forming stars, fluorescent lighting, cold atom condensates, radiation treatment of disease, and the chemistry of earth's atmosphere. Consequently, they have been studied using the contemporary theoretical and computational methods of the time for many years, yet progress continues as we are confronted with challenges presented by new, often more complex systems and by the drive to understand these foundational interactions at an ever more subtle and predictive level. I will illustrate some of this progress using examples from recent work treating very simple systems, for which our knowledge has been both subtly refined and significantly changed, and more complex systems, where complementary methods based on either elaborate treatments or broadly applicable simple models can be used to advance our knowledge.

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