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Heavy particle collisions in astrophysical, fusion, and other plasmas

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Contemporary computational methods to treat few-body, atomic-scale interactions have opened opportunities to study them at a new level of detail to both uncover unexpected phenomena and to create data of unprecedented accuracy and scope for applications. Such interactions 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, radiation treatment of disease, and the chemistry of earth's atmosphere. I will illustrate progress using examples from recent work treating heavy particle collision systems, for which our knowledge has been both subtly refined and significantly changed. Examples will include elastic and transport-related processes in fusion and solar-system plasmas, charge transfer leading to diagnostic light emission in planetary atmospheres and fusion plasmas, and excitation and ionization processes needed for plasma modeling and diagnostics.