Electron - and photon - impact atomic ionization

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The last decade has seen extraordinary theoretical progress in the field of fully kinematically resolved atomic electron-impact ionisation, and its closely related field of double photoionisation. These processes were challenging to calculate due to formal and computational difficulties associated with breakup problems involving the long-range Coulomb potential. Presently, however, these processes can be calculated accurately for simple targets such as atomic hydrogen and helium, irrespective of the kinematics considered or the geometry of detectors. The purpose of this work is to review the recent progress in formal ionisation theory, and show how it relates to the successful computational techniques, which aim to fully solve the ionisation problems without resorting to approximations that limit the applicability of the methods. Such issues are best addressed using relative simple targets such as atomic hydrogen and helium, where we can be very confident in the accuracy of the calculated target structure. Our report addresses also the computational progress, and how it has resulted in a deeper understanding of the formalism of Coulomb few-body problems. The review paper will be published in Phys. Rep.