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Van Regemorter H. Rate of collisional excitation in stellar atmospheres.
Astrophysical J. 136:906-15, 1962.
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Simple expressions are given of cross sections and excitation rates by electron impact for optically allowed transitions in neutral atoms and positive ions, in terms of an effective Gaunt factor and the transition oscillator strength. [The SCI® indicates that this paper has been cited in over 385 publications.]

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This article was written while I was in Boulder, at the University of Colorado. In the early 1960s the role of atomic physics in astrophysical applications was much emphasized. The Joint Institute for Laboratory Astrophysics (JILA) was under construction in Boulder.

Having been trained as an astrophysicist, I spent one year in 1959 at University College London, the UK being the country where atomic collision physics was mostly being developed at that time. M.J. Seaton's group was developing the first close-coupling calculations of electron-atom cross sections; A. Burgess was doing Coulomb-Born calculations for hydrogenic ions; and I wrote one of the first detailed papers on electron-ion collision.¹ Therefore, when I was invited in 1961 along with Seaton to go to Boulder, I was well prepared to write the article under consideration.

In astrophysics at that time, many people were concerned with the new non-local-thermodynamical-equilibrium (LTE) theory of stellar atmospheres. There was an urgent need for numerous electron-atom and electron-ion collision cross sections, and the atomic physicists were asked to give simple expressions to estimate them. This was the background for my invitation to go to Boulder and of my 1962 paper.

In fact, the merit of this contribution must be shared with Seaton, who was preparing his important 1962 paper for D.R. Bates's famous book *Atomic and Molecular Processes*,² and with Burgess, who published a paper very similar to mine on hydrogenic ion collisions.³ A joint paper by the three of us was written at that time but was never published to avoid duplication.

Was the success of this paper foreseeable? In my opinion, it is not a brilliant paper, but it has been a very useful one. It provides not only the cross sections but the rates of excitation for most of the transitions of interest without any calculation in terms of an "effective Gaunt factor" (g), which varies smoothly with energy for neutrals and which appears to be nearly constant for positive ions, times the transition oscillator strength (of a pure radiative process).

Of course, thanks to many more accurate calculations and experiments, the best determination of g has since been improved, in particular for highly ionized atoms. An assessment of this effective Gaunt factor approximation was published not long ago by S.M. Younger and W.L. Wiese.⁴ The article is still cited very often both by astrophysicists and by plasma physicists, in particular by those who are concerned with the radiation of impurities in Tokamaks or other fusion devices.

1. Van Regemorter H. Electron impact excitation of positive ions. *Mon. Notic. Roy. Astron. Soc.* 121:213-31, 1960. (Cited 60 times.)
2. Seaton M J. The theory of excitation and ionization by electron impact. (Bates D R, ed.) *Atomic and molecular processes*. New York: Academic Press, 1962. p. 374-420. (Cited 460 times.)
3. Burgess A. Excitation of hydrogenic ions by electron impact. *Mem. Soc. Roy. Sci. Liège* 4:299-302, 1961. (Cited 50 times.)
4. Younger S M & Wiese W L. Assessment of the effective Gaunt factor approximation. *J. Quant. Spectrosc. Radiat.* 22:161-70, 1979. (Cited 15 times.)