

# This Week's Citation Classic

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**Harris L A.** Analysis of materials by electron-excited Auger electrons. *J. Appl. Phys.* **39**:1419-27, 1968. [General Electric Research and Development Center, Schenectady, NY]

The secondary electron energy distribution from a target struck by an electron beam contains peaks with energies characteristic of the target material. These Auger peaks, enhanced by electron differentiation, provide a sensitive method of analyzing the top few atomic layers of the target for all materials except hydrogen and helium. [The *SC*<sup>®</sup> indicates that this paper has been cited over 325 times since 1968.]

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"My work on Auger Electron Spectroscopy (AES) began early in 1965 at the Research and Development Center of the General Electric Company. It arose from observations of carbon Auger peaks by my colleague, N. R. Whetten, who was studying electron plasma losses in reflected electron beams. Reference to the early perceptive work of J. J. Lander<sup>1</sup> made it clear to Whetten and to V. L. Stout that the phenomenon could be usefully developed as a new and valuable method of atomic surface analysis. It was Stout's suggestion that differentiating the electron energy distribution curve would enhance the visibility of the Auger peaks. Fortunately I was in a position to undertake the suggested development with the diligent and capable assistance of A. N. DeTommasi.

"With Lander's paper to guide us we soon achieved results that exceeded our expectations and were able to make use of the new technique in connection with a number of practical problems. Our first papers were submitted in April of 1967 and the work was described at the 1967 Denver X-ray Conference. In June of 1967 we de-

scribed our work to W. T. Peria and R. E. Weber of the University of Minnesota who quickly reproduced our results using different apparatus designed for low-energy electron diffraction (LEED) studies.<sup>2</sup>

"The satisfaction provided by this successful project was marred by two events. The first was an inordinate delay in publication of my paper, which actually appeared after that by Weber and Peria. The second disappointment was that during the ensuing burst of activity in this field changing priorities within the Company shifted to other areas, so that eventually I had to turn my efforts toward other activities.

"Those negative aspects are more than compensated by the gratification of seeing the technique taken up by so many workers and developed and commercialized so that it is now available as a standard analytical tool for workers in many fields. I am very pleased as well to have been honored with fellowship in the American Physical Society, and by the American Vacuum Society which chose me for the Medard W. Welch Award in 1973.

"I believe the paper is often cited because it provided the first demonstration of the utility, power, and ease of this method of surface analysis. It was taken up by so many because it appeared at a time when research in surface physics was flourishing and AES provided a way to answer many questions outstanding at the time. It came, moreover, at a time when recent significant advances in vacuum technology and electronic instrumentation made it quite possible to repeat these experiments in many laboratories. Though AES is now only one of a great variety of available electron and ion spectroscopies, I like to think that its appearance provided some added stimulus to the many other developments then in progress and yet to follow."

1. **Lander J J.** Auger peaks in the energy spectra of secondary electrons from various materials. *Phys. Rev.* **91**:1382-7, 1953.

2. **Weber R E and Peria W T.** Use of LEED apparatus for the detection and identification of surface contaminants. *J. Appl. Phys.* **38**:4355-8, 1967.