The response of a plane-bound electron gas to an incident, swift, charged particle was studied theoretically. It was predicted that measured electron energy loss spectra should exhibit structure due to surface collective modes. The dispersive properties of the surface plasmon (SP) due to the proximity of the two bounding surfaces were discussed, and distinguishing characteristics of losses to SPs were described. [The SCP indicates that this paper has been cited in over 435 publications since 1957.]

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The paper was written while I was a staff member in the Health Physics Division at Oak Ridge National Laboratory (ORNL) and a part-time graduate student in the Department of Physics at the University of Tennessee. With my colleagues R.D. Birkhoff and J. Neufeld, I had been analyzing electron energy loss data and learning about the dielectric theory of energy loss. I became curious about the distribution of energy losses when a swift electron passes through a thin metal foil and worked out the theoretical spectrum for this case using both local dielectric theory and the hydrodynamical model of Bloch to describe the response of the metal.

Subsequently, Birkhoff and I both submitted abstracts of papers to a conference at the University of Maryland, although I was unable to attend because of a conflicting business trip. Birkhoff was kind enough to present my paper in addition to his own. After delivering my paper, he was startled at the vociferous criticism of my work from a prestigious audience. He had worked on the same problem the previous year, and was concerned that he had not found surface plasmon (SP) modes in a bounded medium. Although I could find no definitive evidence that the losses to SPs had been observed in any of the published results on characteristic energy losses by electrons to metallic films, I could see no reason why the SP would not be generated with appreciable probability in a properly designed experiment. So I described the distinguishing characteristics of losses to these modes as completely as I could on the basis of the model at hand and sent the paper to Physical Review.

About three years later, in a lovely series of experiments, Cedric Powell and John Swan, at the University of Western Australia, fully confirmed the existence of SP losses by electrons in reflection geometry. The reason this paper has been so frequently cited lies in the rapid development of surface science over the last two decades. The SP is a prominent feature in electron energy loss experiments, surface plasmon spectroscopy, the optical response of solids, photoemission work, and many other areas of active research. It has been shown to be intimately involved in the image force on a charge external to a metal. In addition, the SP has served as a stimulus to the development of the many-body theory of the bounded electron gas (see, for example, references 7-9). Several reviews covering recent developments are available (see, for example, references 8 and 9).

I have been most fortunate to have worked in an interdisciplinary division at ORNL that has continually maintained a strong basic physics effort. This enlightened atmosphere has made it a delightful place to be. I would like especially to express my appreciation for the support of Karl Z. Morgan (then division director); of my colleagues Birkhoff, G.S. Hurst, and Neufeld; and of many others in our division for their help and guidance over the years.

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