

## Reply to the Comments Made by A. J. Greenfield and N. Wiser

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IN a previous paper<sup>1</sup> it was shown that the early stage of an exploding wire can be treated by Ziman's theory of liquid-metal resistivity. The resistivity as a function of particle density was measured and a theoretical curve using Ziman's theory of conductivity and the hard-sphere structure factor was fitted to the data. The screened Coulomb potential was used because of its simplicity and a hard-sphere diameter was chosen to fit the data.

Greenfield and Wiser<sup>2</sup> claim that on theoretical grounds the potential proposed by them is more consistent with known properties of copper. We did not claim that the screened Coulomb potential is the best of all possible pseudopotentials; it obviously is not. Better forms of pseudopotentials are readily available<sup>3</sup> although not specifically for copper.

*Note added in proof.* A pseudopotential for copper which shows encouraging agreement with experimental results has recently been developed.<sup>4,5</sup>

To show that the Greenfield and Wiser comment,

<sup>1</sup> N. Ben-Yosef and A. G. Rubin, Phys. Rev. Letters **23** 289 (1969).

<sup>2</sup> A. J. Greenfield and N. Wiser, preceding paper, Phys. Rev. B **1**, 4186 (1970).

<sup>3</sup> W. A. Harrison, *Pseudopotentials in the Theory of Metals* (Benjamin, New York, 1966).

although numerically correct, does not apply to the main point of our paper, we wish to point out that the pseudopotential proposed by them leads to a discrepancy of only a factor of 4 at a density of  $1 \times 10^{22} \text{ cm}^{-3}$ , if one uses the original hard-sphere diameter of 3.05 Å. A second point which justifies our original claim is the fact that if the pseudopotential proposed by Greenfield and Wiser is used to calculate the resistivity with a recently measured<sup>6</sup> hard-sphere diameter for copper of 2.25 Å, the discrepancy mentioned by them is reduced to a factor of 3 throughout the density range measured.

There remains sufficient uncertainty in the hard-sphere diameter and in the pseudopotential that we consider the agreement of the theory to the data to be satisfactory. In spite of the fact that the theory can be refined in various ways, the basic conclusions of<sup>1</sup> is not changed in any way. It can be concluded that although the screened Coulomb potential is not the most realistic one, the early phase of an exploding wire can be treated by Ziman's theory of conductivity of liquid metals.

<sup>4</sup> C. Y. Fong and M. L. Cohen, Phys. Rev. Letters **24**, 306 (1970).

<sup>5</sup> Nature **225**, 901 (1970).

<sup>6</sup> D. Schiff (private communication).