

The values of  $Q$  and  $V^*$  found in these experiments are compared with other related quantities in Table 1. Change in the state of order in  $\text{Cu}_3\text{Au}$  involves thermally activated movements of both the Au and the Cu atoms; the slowest moving species will determine the ordering rate. This is expected to be the Au atom because of its greater size. The data in Table 1 show that the activation volumes for the diffusion of Au in Au, in  $\text{Cu}_3\text{Au}$ , and in a Ag-Au alloy are all the same (within experimental error). Since Ag and Au have almost identical atomic radii, equal activation volumes would be expected in the Au-Ag alloy. In Cu-Au alloys, there is a decrease in specific volume as Cu is added to Au. In all of these close packed structures atom movements occur by the vacancy mechanism and  $V^* = V_f + V_m^*$  where  $V_f$  is the volume of vacancy formation and  $V_m^*$  is the activation volume for the interchange of a vacancy and an atom. In the close packed metals  $V_m^*$  is only about 15% of  $V^*$ . As Cu is added to Au,  $V_m^*$  is expected to increase for the jump of Au atoms, but since  $V_m^*$  is such a small part of  $V^*$  this would not much affect the measured activation volume. No activation volume measurements are available for pure Cu but, on the basis of its molar volume  $V^*$  is estimated to be about  $5 \text{ cm}^3/\text{mole}$ . That  $V^*$  for ordering in  $\text{Cu}_3\text{Au}$  is not significantly less than for self diffusion in Au indicates that  $V^*$  in the alloy is principally determined by the formation of vacancies on the Au sublattice.