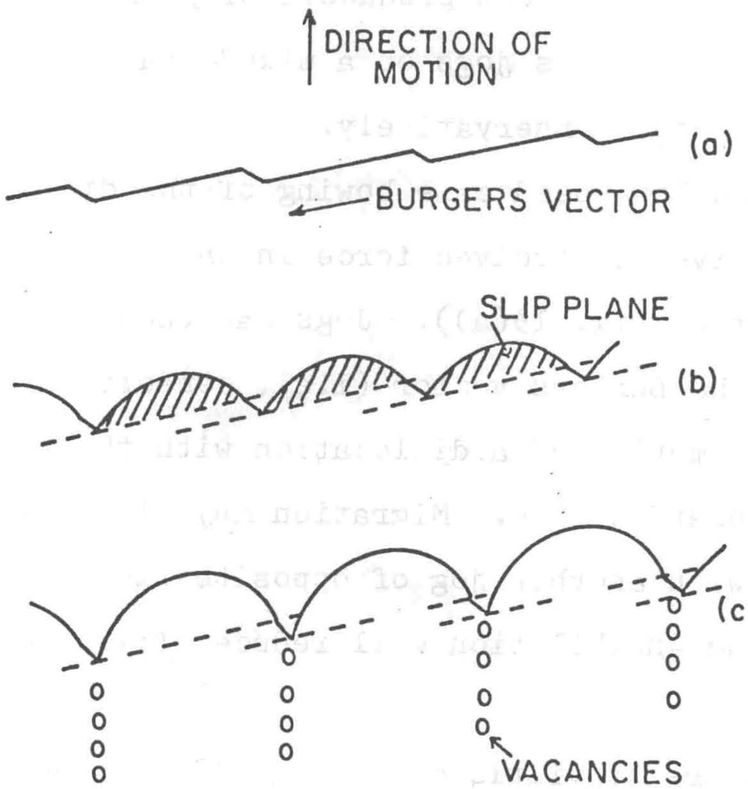

Fig. 12. Motion of a jogged screw dislocation. (a) Straight dislocation under zero stress. (b) Dislocation bowed out in the slip plane between jogs due to applied shear stress. (c) Motion of dislocation after reaching critical stress, leaving trails of vacancies behind the jogs. (After Hull (1965).)

Weertman (1961) has considered production of point defects by dislocations moving at relativistic speeds. For most dislocations the limit speed is the shear wave speed for that solid. He predicts that relativistic ($v > 0.95\ c_s$) dislocations will be much more efficient producers of point defects than slow ones; at low speeds jogs on a mixed-character dislocation may be able to move conservatively.

For the low-speed case bowing of the dislocation due to drag of jogs gives a resolved force in the direction of the Burgers vector b (Fig. 13(a)). Jogs can then move in the direction of the Burgers vector (i.e., conservatively) by combining overall motion of a dislocation with their own migration down the dislocation line. Migration may also lead to their annihilation with another jog of opposite sign. Both conservative motion and annihilation will reduce efficiency of defect production.

In the relativistic case (Fig. 13(b)) jogs would have to move at supersonic speeds in order to move in the direction of the Burgers vector. Furthermore, the reduced bowing of the dislocation line at high speeds (due to increased self-energy) will retard jog migration down the line. Therefore, one concludes that jogs on high-speed dislocations will have to move nonconservatively and produce a trail of point defects. According to Weertman, experimental observation in fast deformation of defect concentrations larger than found in slow deformation to the same strain will be confirmation of the presence of relativistic dislocations. At ordinary temperatures he