1.4. *Dislocation Core and Atomic Force*

Early development of dislocation theory, and related theoretical treatment of metallic properties controlled by dislocations, focussed most attention on the effects of long-range elastic fields. In the present context (see also Vitek, 1995) mechanical properties were frequently analyzed in terms of long-range dislocation-dislocation, dislocation-point defects, etc interactions. The attitude prevailing in the late 1960s that dislocation cores were of but secondary importance in the plastic deformation of metals was radically altered in the next two decades. It became widely recognized then that dislocation core phenomena could play a role at least as important as long-range interactions in the deformation behaviour of many materials. As emphasized in the studies of Vitek and co-workers (Vitek, 1985) clear signatures of core effects are to be found in deformation modes and slip geometry, strong orientation and temperature dependences of the yield stress, and also in anomalous temperature dependence of the yield and flow stresses (see also Duesbery and Richardson, 1991).

Significant impetus for such atomistic modeling has been the marked improvement in experimental techniques (see Appendix 2.1), such as high resolution electron microscopy (HREM), that are capable of atomic resolution.

1.5. *Stacking Faults*

Rosenberg (1992) discussed how close-packed planes of hard spheres can be stacked to form, say, an fcc structure, Fig. 1.2 being reproduced from his account.

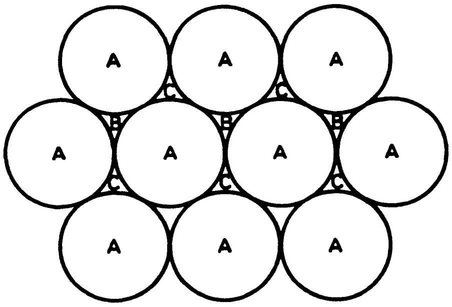

Fig. 1.2. The close-packed array of spheres. Note the three different possible positions. A, B and C for the successive layers.