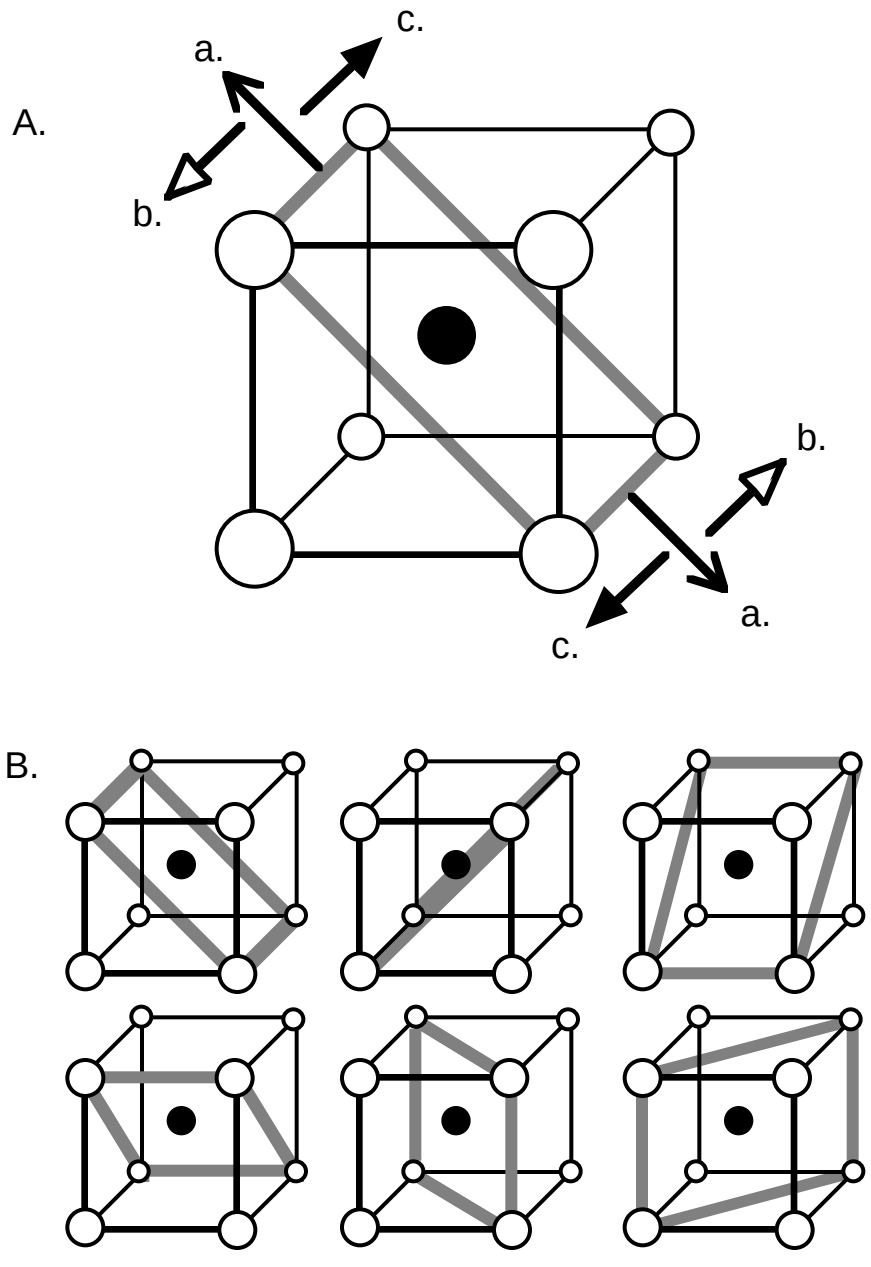
APPENDIX B

As was mentioned in Investigation 2, the flexibility of the martensite phase of NiTi can be explained by the existence of "variants" in the structure and the ability of these variants to shift to relieve the applied stress during deformation. This relaxation of stress by the reorientation of the variants gives this phase of NiTi a property we call flexibility.

The nature of these variants, however, is not obvious. Hopefully the figure below will help to clarify how these variants originate.



During the transition from austenite to martensite the overall movement of atoms in the structure is both a sliding motion and a shearing one. These are relatively sinple movements, but there are 24 different ways in which they may be carried out. Figure **A** above illustrates the two types of shearing that occur. The planes can slide relative to one another in each of two directions (arrows **a**) parallel to the face diagonal. Because this is a sliding motion the atoms are displaced without changing the 90° angles of the plane. The planes can also shear through the simultaneous motion in two directions parallel to the cell edges(either pair of arrows **b** or **c).** Because this is a shearing motion; the plane is being pulled in opposite directions at the top and bottom; the 90° angles of the plane are destroyed. The result from **A** alone is a total of four martensite variants for each plane that passes through a face diagonal in the CsCl structure. A shift up; a shift down; a shear in which the top goes left and the bottom, right; and a shear in which the top goes right and the bottom, left.

Figure **B** shows six equivalent planes that pass through face diagonals in the CsCl structure. Therefore, a total of 6 x 4 = 24 different variants may grow from the planes.