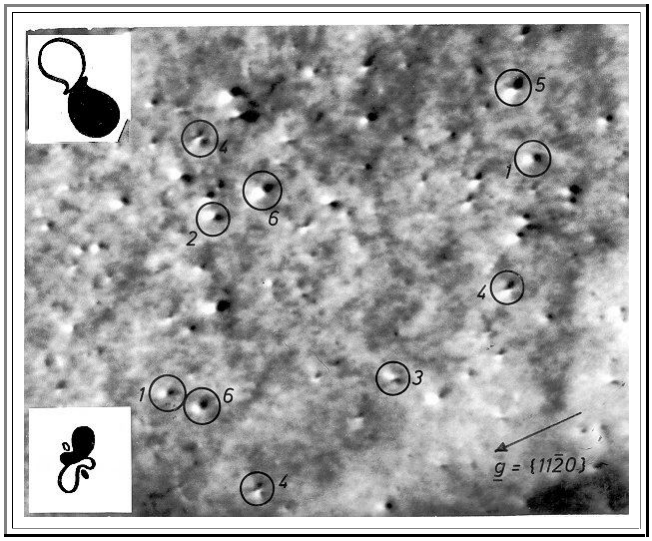
Radiation Damage in Cobalt

Illustration

- Metal irradiated with ions (in the following examples **Au** -ion with energies of some **10 kV**) will be heavily damaged; besides lots of Frenkel pairs, small vacancy type dislocation loops usually form some **10 nm** below the surface.
  - This kind of research was important for nuclear materials science and for ion implantation techniques in general.
  - The loops are far too small to be seen as loops in conventional imaging; at best they appear as black dots. However, if imaged with dynamical bright-field conditions, they give rise to so-called black-white contrasts with peculiar geometries.
  - The following picture shows black-white contrasts of dislocation loops imaged with a **{1,1,-2,0}** type of diffraction vector in a specimen with a **{0001}** orientation. Six distinctly different kinds of contrast are observed. Two calculated contrast profiles for a particular set of Burgers vector and normal vector of the loop are also included. The size of the black-white contrasts is about **20 nm**.



  - Same as before, but for a **{1122}** type specimen orientation. The observed contrasts match closely the calculated profiles for the types of dislocation loops assumed.