**V. *Interference figures***

Interference figures from anisotropic minerals have two main uses. (1) They aid in mineral identification by revealing the optical class of a mineral and (2) they allow the microscopist to determine the mineral's orientation, which is required for refractive index measurements and, in conjunction with x-ray crystallography, to determine a mineral's optical orientation. Interference figures are viewed by converting the PLM into conoscopic illumination. This is done by using the high numerical aperture lens (usually the highest power), crossing the polars, inserting a substage condensing lens, and inserting the Bertrad lens or removing

the ocular.

There is a relationship between conoscopic and orthoscopic illumination. Whatever is occurring at the center of the field (the cross hair intersection) in conoscopic illumination will occur over the entire field in orthoscopic illumination. The crystal will be at extinction when switched to an orthoscopic view if the center of the field was dark in conoscopic illumination.

1. **Uniaxial:**

**Uniaxial Minerals**

Anisotropic minerals that have a single optic axis and crystallize in the [hexagonal and tetragonal](http://www.allaboutgemstones.com/crystalline_structures.html) crystal systems are called "uniaxial minerals." In these minerals, when light travels along the direction of their single "optic axis" they exhibit the same optical properties as isotropic materials; meaning that the polarization direction of the light is not changed by its passage through the material.

This single "optic axis" is coincident with the c-axis in hexagonal and tetragonal minerals, so if the light travels parallel to the c-axis it will behave as if it were traveling through an isotropic material. As is the case with all *anisotropic* minerals, a uniaxial mineral's refractive indices will typically vary between two values which are defined as "****" (or No) and "****" (or Ne).

There are two limiting types of interference uniaxial figures: the flash figure (when the optic axis is parallel to the microscope stage) and the optic axis figure (when the optic axis is perpendicular to the microscope stage). There is an infinite number of off-centered optic axis figures in which the optic axis is not parallel or perpendicular to the microscope stage.

Figure 8 is a view of a centered optic axis figure. The figure shows isogyres, which are areas of extinction, and isochromes, which are lines of equal retardation. Stage rotation has no effect on a perfectly centered optic axis figure. The retardation increases moving outward from the outcrop of the optic axis, the melotope, which is in the center of the field

of view. To determine the optic sign, a retardation plate is inserted with its N (slow) direction known and areas of the figure exhibiting subtraction and addition are observed. Recall that uniaxial minerals are positive when > and negative when < . The vibration direction always occurs tangent to the isochromes, and or ' are always perpendicular to

. If subtraction occurs when N of the plate is parallel to then is n of the crystal and the crystal is positive. Conversely, as shown in Figure 8, if N of the plate is parallel to and addition occurs, the mineral is negative. Only the index can be measured when the optic axis is perpendicular

to the stage.

The characteristic of a flash figure is the entire field of view is dark at extinction, except for some small areas at the edge of the field of view. After a slight stage rotation of only a few degrees, the interference figure "breaks-up" and leaves the field of view. When the figure "breaks-up" it does so into two diffuse dark hyperbolas that leave the field of view into the quadrants into which the optic axis is being rotated. Once this type of figure has been located. To locate crystals that may exhibit these interference figures from the many small crystals that may be present on the slide, look for the largest grain with the lowest retardation for a centered optic axis figure and the smallest grain with the greatest retardation to obtain a flash figure.