Optical mineralogy: Outdated and essential

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While the title of this abstract may be somewhat perplexing, it is even more perplexing how we in the geosciences have neglected the role optical mineralogy can have in our teaching and research efforts, not to mention the fact anyone trained in the use of a PLM (polarizing, *not* petrographic, light microscope) would find immediate employment, albeit probably outside the field of geology.

In geoeducation circles we often hear words and phrases like hands-on, interactive, critical thinking, interdisciplinary, spiral learning, and 3-D visualization, while Becke lines, dispersion staining, grain mounts, sign of elongation, extinction angle, and optical indicatrix are seldom used. However, the teaching of these optical methods, which are often viewed as outdated, and proper training in the use of the PLM will by themselves lead to improved learning. And this, if for no other reason, might warrant the reinclusion of a semester-long optical mineralogy course into a geoscience curriculum.

Unfortunately, many mid-career geoscientists were never taught optical skills and many older ones no longer use them, and as a result many of our research efforts have suffered. For instance, such optical phenonomen as retardation can be used to "observe" cation diffusion in minerals as well as to quickly observe the distribution of elements, in a similar manner as one uses back-scattered electon images. For any researchers interested in studying the orientational dependence of the physical properties of minerals, the addition of a spindle stage to the PLM yields exceptional results. For instance, spectroscopic methods ranging from IR to XANES require knowledge of a mineral's orientation. With the aid of the spindle stage, one can orient single crystals before such measurements are made to gain an understanding of how spectra vary as a function of orientation.

Unfortunately (again), we have witnessed a decline in the teaching of these methods and use of the PLM, mainly because optical mineralogy is viewed as a prerequisite for petrology, and as an emphasis on petrology has declined, giving way to environment-based courses, so too has the need to teach optics. However, optical mineralogy has countless applications, especially in environmental issues relating to dust inhalation, and we, as geoscience educators, can, if we choose, work to meet these societal needs.