DEMONSTRATION OF INTERFERENCE FIGURES

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The development of new polarizing materials in the last decades and their current widespread availability in the form of Polaroid have made possible several demonstrations with polarized light that were formerly difficult or impracticable on account of the cost and small aperture of calcite polarizing prisms.

One of the most striking experiments is observation and projection of interference figures by the use of Polaroid plates and polished spheres of birefringent material. The experiment is adapted either for direct study by the student or for screen projection to illustrate a talk. Excellent interference figures may be observed with quartz or corudum spheres $\frac{3}{8}$ to $\frac{1}{2}$ inch in diameter. Calcite and topaz have too much birefringence for observation of color curves, but give fine, sharp isogyres. The experiment is ideal for demonstrating the properties of interference figures, because it lends itself readily to either individual or classroom instruction. The student can see for himself the effect of rotations of the crystal about various axes including that of the rotating stage of the microscope. He can handle the ball himself, observe the position of the uniaxial or the biaxial figure, and determine by experiment the effect of crystal orientation on the interference figure. An effective screen demonstration can be arranged using a vertical projector such as a Spencer Science Delineascope.

Many amateur lapidists are well equipped to cut and at least rough-polish suitable spheres from quartz and other clear crystal. An imperfect polish is sufficient for the experiment. A rough-ground surface may even be "polished" by a coat of clear lacquer. I have recently seen some beautifully polished corundum spheres, diameters from 1 mm. to $\frac{1}{2}$ inch, made by the Laboratory of the Linde Air Products Company at Tonawanda, N. Y.; these spheres are excellent for the experiment described here. Dr. A. N. Winchell of the American Cyanamid Company, Stamford, Conn., has obtained excellent spheres of calcite and topaz. Each of the materials mentioned gives a result different from that of the others: quartz shows the effect of rotatory polarization; corundum shows the color curves and sometimes slight biaxiality; calcite shows the sharpest isogyres, but almost no color curves can be seen because of their close spacing, due to high birefringence; topaz illustrates the corresponding condition for a biaxial crystal of large axial angle.

This note is published mainly to call the attention of colleagues in the teaching profession to a useful and valuable experiment. No originality

is claimed, though I am not aware of any references describing the demonstration.

PRESERVATION OF SPECIMENS OF MARCASITE AND PYRITE

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The instability of pyrite and marcasite is one that all collectors and curators have experienced, and a cure for which is greatly to be desired. A method of arresting the alteration has been described by Bannister,[1] who also listed localities from which these sulfides were particularly unstable.

The oxidation of pyrite and marcasite results in a series of ferrous sulfates of varying degrees of hydration, but they are hygroscopic and will react with whatever moisture there is in the atmosphere, and the chain reactions gradually cause disintegration of the specimens. Washing with water, in an attempt to dissolve out the salts may produce less soluble basic salts; these are also hygroscopic and the result is merely a postponement of the final breakup of the material.

The following new method has been found successful with pyrite and marcasite specimens which did not contain any associated minerals affected by concentrated HCl; and one must be assured of the absence of even microscopic amounts of such impurities. Pyrite and marcasite are not noticeably attacked by HCl.

The pyrite or marcasite specimen is placed in a closely fitting beaker, and just covered with pure, *colorless*, *concentrated* HCl. The yellow color quickly assumed by the acid will evince the necessity of the treatment. After a good soaking (perhaps 10 or 15 minutes), the specimen is removed and drained, and placed in fresh, colorless concentrated acid. This procedure is continued until there is no discoloration of the acid. One can now be sure that there are no soluble iron salts left in the pyrite or marcasite, as it takes only a trace of these to discolor the acid.

Since no water must be introduced into the mineral, the specimens are drained, and then soaked in ether until all of the acid is removed. Two soakings in ether should leave the specimens perfectly clean and safe from further alteration even without coating them with plastic films.

Nevertheless, specimens of pyrite and marcasite which have suffered even slight alteration may be quite friable, and it is advisable to soak these in a solution of a plastic to hold them together: the solution recommended by Bannister is one containing 7% (by weight) of vinyl acetate in an equal mixture of acetone and toluene.

[1] Bannister, F. A., *Museums Journal*, **33**, 72–75 (1933); and **36**, 465–476 (1937).