Northwest Micro Mineral Study Group

MICRO PROBE

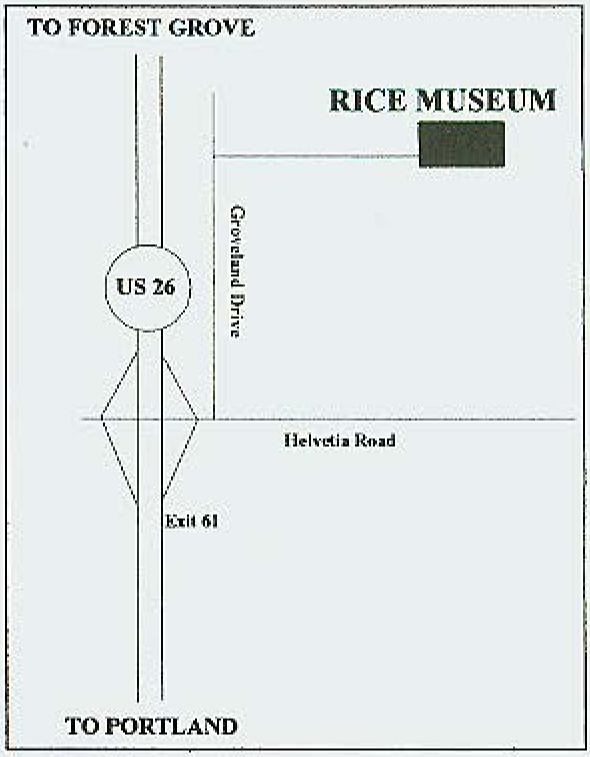
FALL, 2003 VOLUME IX, Number 8

FALL MEETING . .. . .HILLSBORO, OREGON

November 8, 2003 **9:30 am to 5:00 pm**

Rice NW Museum of Rocks and Minerals
26385 NW Groveland Drive
Hillsboro, Oregon

We are meeting in a new location. To reach the Rice Museum, take the Sunset Highway (US 26) west from Portland. Exit at Helvetia Road (exit 61). Jog right 100 feet, then left onto Groveland Drive. The museum is in the trees 1.3 miles to the west. We will be able to view the Museum's displays as well as have our usual program and free table. So bring your microscope and plan to enjoy the day. See the last page for more details.



The program for the day will focus on techniques for photographing minerals.

Morning:

11 am "A Digital View Through the Scope", *Doug Merson.*

Afternoon:

2 pm "Photoshop Image Enhancement for Photo-micrography of Minerals", *Saul Krotki.*

Following, we will have a short business meeting and our usual review of the collecting status of locations in the Northwest. We will also expect an update on the future plans for the Rice museum.

The kitchen area is available and the club will provide lemonade, coffee, hot water, and the basics for sandwiches. So bring the extras for lunch and we will plan to have a sort of "pot luck" feast at noon. Restaurants are available in the local area. Some of us will get together to eat dinner, so please plan to join us if at all possible.

IN MEMORY OF PHILIP MURPHY

1908 - 2003

We will all miss the presence of Phil, who died of conjestive heart failure on May 22, 2003 after 95 years of life. Phil, together with his late wife, Beulah, was one of the founding members of the Northwest Micromineral Study Group. He was also active in the Oregon Agate and Mineral Club, and in Friends of Mineralogy over the years. Although he staunchly refused to take an office in any of these groups, he was always ready, willing and able to lend a hand and help with whatever needed doing.

Phil took great delight in field trips over the years. He has probably been to most of the agate and thunder egg locations in the state of Oregon, and for many years was an active participant in the field trips of our group after his interest turned from cutting and polishing to collecting minerals. Though health concerns kept Phil and Beulah from doing active field collecting in recent years, his delight in a beautiful specimen never dimmed.

His interest in minerals was actually of long standing. He and Beulah managed to purchase some outstanding specimens of copper minerals and rhodochrosite, as well as several unusual pieces of local origin, back in the days when the price did not reach three, let alone four figures. A couple of those specimens are in the collection of the Rice Museum and will remain as a tribute to the two of them.

What many of us will remember most about Phil was his hospitality. For years we would gather in the little "shop" lined with egg cartons full of minerals once a month to look at each other's stuff and just generally have a time of fellowship over our microscopes. Phil always had the stove cranked up early so that the place would be warm. And then, after a while, we would go in and share coffee and cookies, or cake and ice cream, but mostly just reminisce about good times and memories of old friends. Those of us in Portland will always remember those evenings and the friendships we made.

Phil loved the little crystals nestled down in a cavity of the rock. But even more, he loved the people who loved those little crystals. And we loved him. I want to remember him as a friend who also collected the same minerals I love.

Don Howard

A DIGITAL VIEW THROUGH THE SCOPE

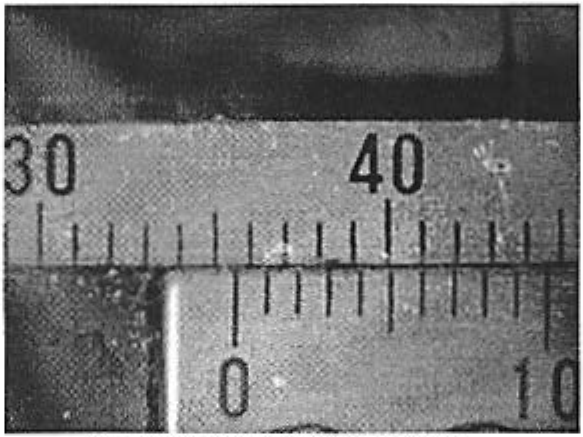
Doug Merson

Two years ago I purchased a new stereo microscope. After having had the opportunity to try a Meiji EMZ-5TR at the Everett mineral show five years ago, I set out to put aside the money to acquire one. The EMZ-5TR comes with a photo tube. After spending several months reviewing my micro collection and seeing it as never before, I decided to add a digital camera to the set up. I chose the Fuji Fine Pix 4700 that Absolute Clarity & Calibration offered, the same company that I bought my scope from.

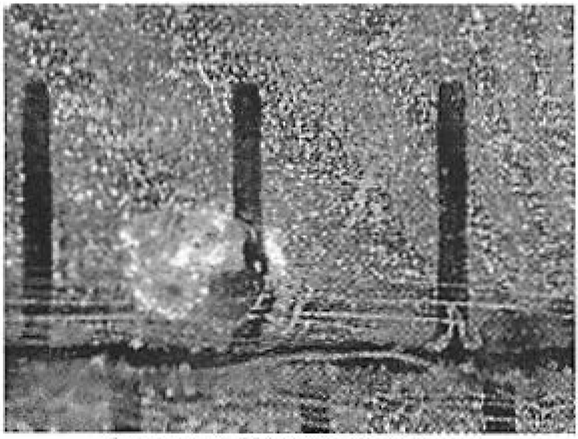
The camera came with a custom adapter to make mounting to the photo tube simple. The adapter also included a lens. The camera has three image sizes available. I use the 2400 x 1800 pixel image with the least compression to achieve the most detail. This gives an uncompressed file size of 12.3 MB. As the camera uses JPEG compression I end up with a compressed file size of about 1 MB. Shooting is done with the camera in the manual mode so that I have control over the type of metering and white balance. I have found that spot meeting works best. The white balance is set to incandescent which provides a good representation of the true color of the specimen. When shooting fibrous, transparent, or highly reflective minerals it may be necessary to use the manual focus option. The camera also gives a choice of shooting at three film speeds, 200, 400, and 800 ASA. All my photos are taken using the 200 ASA setting. Just as with film, the image becomes grainy as the ASA rating is increased. I use the cable release to trigger the camera, thus reducing any vibration. The self timer could also be utilized to reduce vibration.

Illumination is provided by a TECHNOQUIP 150 watt fiber optic illuminator using two light pipes. On occasion I will also use my single bundle Dolan Jennings fiber optic light. The light source, at full power, is 3200 K.

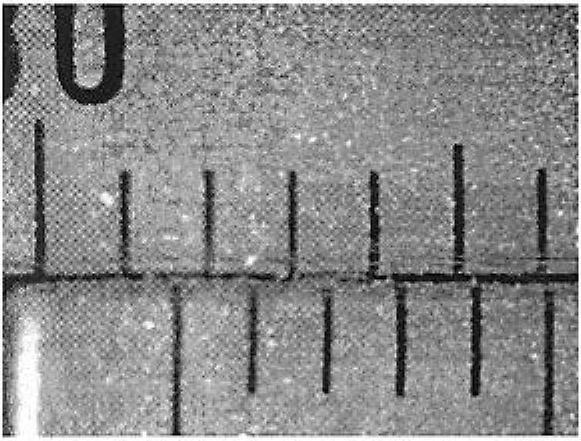
The microscope has .7X to 4.5X zoom objectives. I purchased it with 15X wide field oculars. This gives the scope a range of 10.5 X to 67.5 X with a field of view ranging from 22 mm to 3.4 mm. With the camera at 3X zoom and the scope at 4.5X zoom, one millimeter will fill the frame. With no zoom on either the camera or scope the field of view is 17 millimeters. The depth of field ranges down to less than a millimeter. The following images show the effects of camera and scope zoom. A number of people who have seen my photos posted on the internet have commented on the apparent depth of field I have achieved. They felt that digital cameras seemed to have a greater depth of field. The physics of lens design will limit the depth of field obtainable. It is the image processing that gives an apparent greater depth of field.



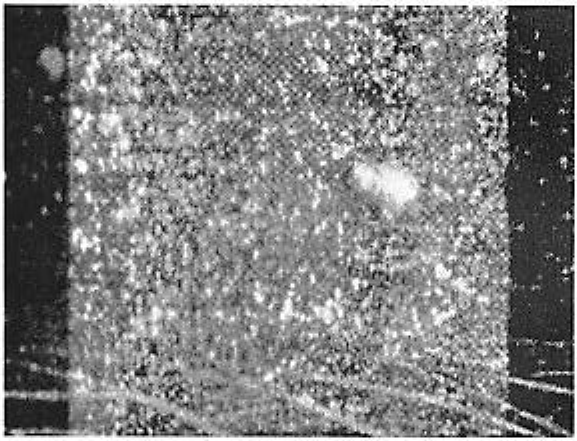
Scope at .7X and camera at 0X



Scope at 4.7X and camera at 0X

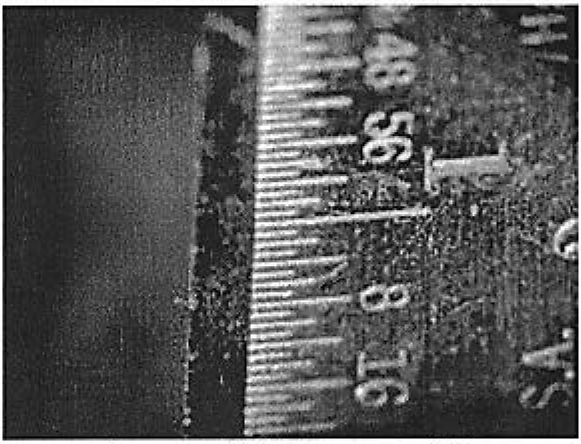


Scope at .7X and camera at 3X

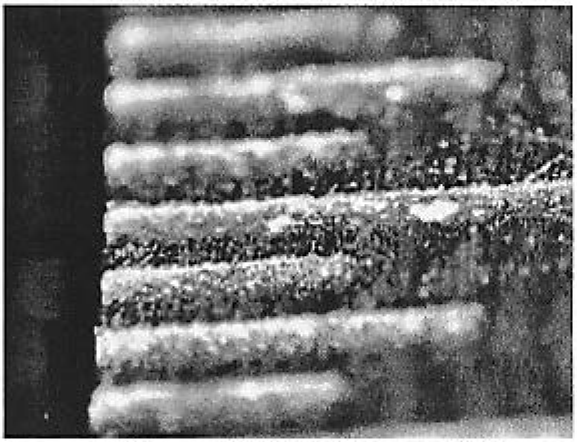


Scope at 4.7X and camera at 3X

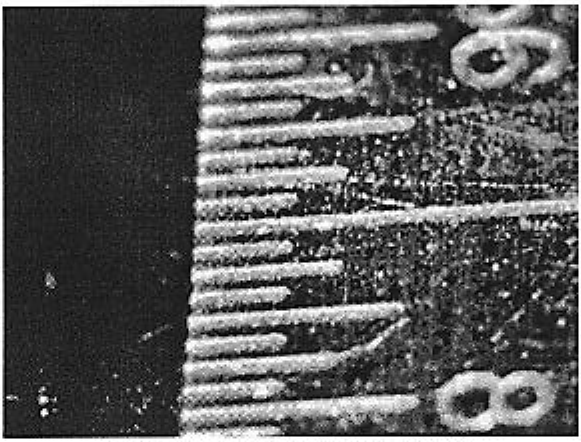
The next sequence of photos illustrates the depth of field. The photos were taken of a machinists scale attached to a combination square head so that the scale is at 45 degrees vertical axis.



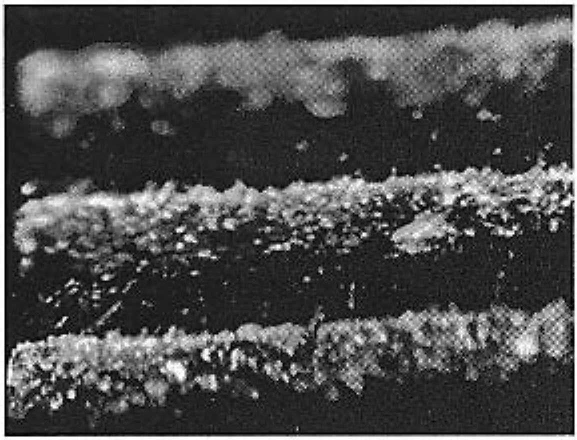
Scope at .7X and camera at 0X



Scope at 4.5X and camera at 0X



Scope at .7X and camera at 3X



Scope at 4.5X and camera at 3X

As the view through the scope is different than what the camera sees, I send the video output of the camera to a 13 inch color television. This make composition much easier as I lose the left eye when the image is sent to the camera. Focusing is best adjusted using the TV as you can monitor the depth of field. The specimens are placed on the two axis stage for shooting. The stage has millimeter scales on both axes. After taking the picture I move the horizontal scale into view and focus on it. I can than read the horizontal dimension of the image from the TV screen. You must not change the zoom factor when doing this.

After taking a series of photos I download them to the computer using the USB connection. This put the images into the My Pictures folder. I use Jasc Paint Shop Pro for image editing. Color balance, contrast, color saturation, and clarity are normally adjusted. Adjusting the contrast and clarity give the impression of greater depth of field. I have only scratched the surface of the capabilities of this program. At the recent Friends of Mineralogy Symposium, Saul Krotki gave a presentation on using Adobe Photo Shop for working with images. One method he discussed was to take two images at slightly different focal points and use Photo Shop to combine the images. This worked very well when you have one crystal above another. The combined photo will have both in focus. There are programs available for combining a number of photos into one to improve depth of field. I have one I have downloaded but have not tried yet.

I have placed photos on two web sites. I started out posting to the photo gallery at Mineral Database run by Jolyon Ralph. It is an extensive listing of minerals, localities, mineral data, and photos. It may be found at http://www.mindat.org. I also have space on Image Event where I have mineral photos, field trip photos, and other photos posted. They may be found at http://www.imageevent/microcollector.

With the falling prices of digital cameras and the increasing quality of the images, this is a good way to get into mineral photography through the scope. Adapters for attaching a digital camera to a scope are not common. You may find that you have to make your own. Some folks will shoot through the ocular just holding the camera up to it. For those willing to spend the money, there are now digital cameras that take standard 35 mm lenses. Photo adapters are readily available for these.

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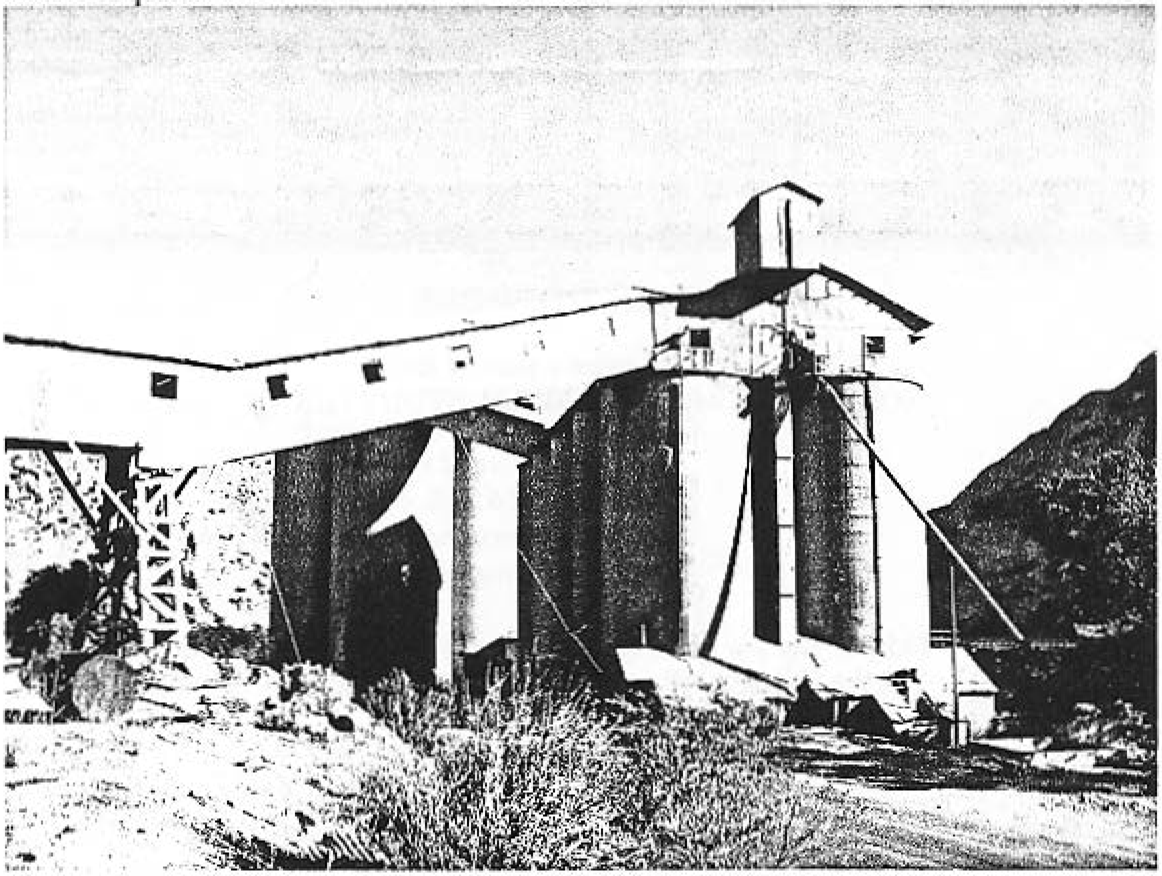
Orthoclase Crystals and Twins from Lime, Baker County, Oregon

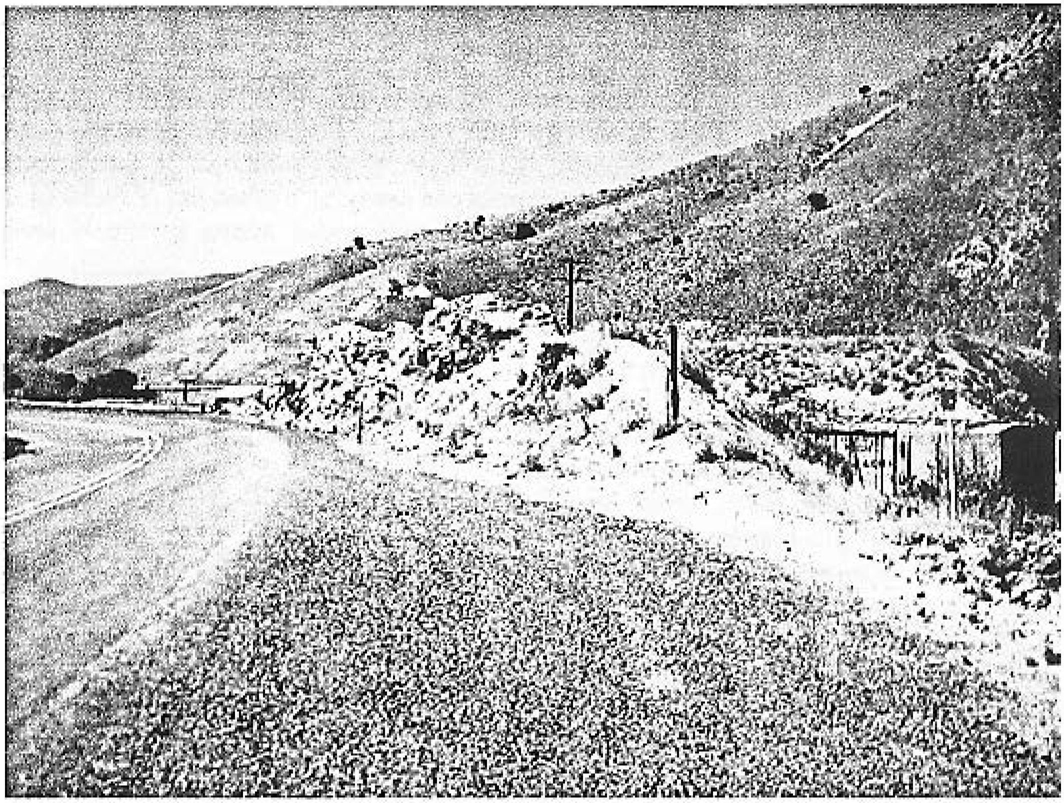
Donald G. Howard

A major landmark along Interstate 84 between Baker City and Ontario is the remains of the old cement plant at Lime in Baker County. A post office was established at Lime in 1899 to serve a community that grew up to exploit the extensive limestone beds in that area. The large plant whose remains still mark the site was built in 1925 by the Sun Portland Cement Company to provide cement for the Owyhee Dam. After the dam was completed in 1928, ownership passed to the Oregon Portland Cement Company who kept it in operation through 1981. Since then, cement production has shifted to a more modern plant several miles to the west. The plant at Lime was used to recycle tires for a while and then fell into disuse. Since much of it was constructed of very sturdy concrete, the abandon skeleton of the operation is still very much in evidence along the interstate highway.

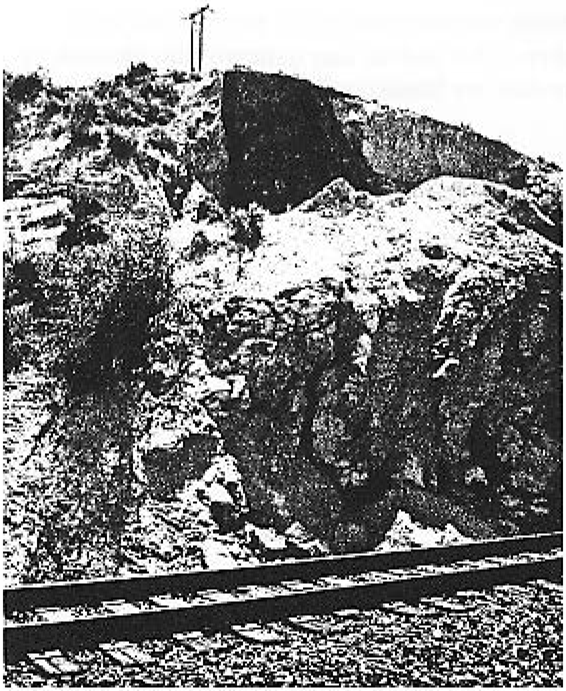
In this area, the Burnt River is passing down through extensive limestone beds on its way to join the Snake River near Farewell Bend. Many of these on the south side of the canyon have been extensively worked to provide the raw material for the cement plants. Just east of the old plant, several dikes cut across these beds. One of these is very dark and prominent on the north side of the canyon across the river from the interstate. It meets the access road in a road cut about a half mile east of the old plant. At that point, the railroad has just crossed a bridge over the river and also passes through a small cut in that dike. The collecting area is along the west side of that dike in a crumbly, tan colored zone composed primarily of feldspar with a few dark spherical masses of quartz.



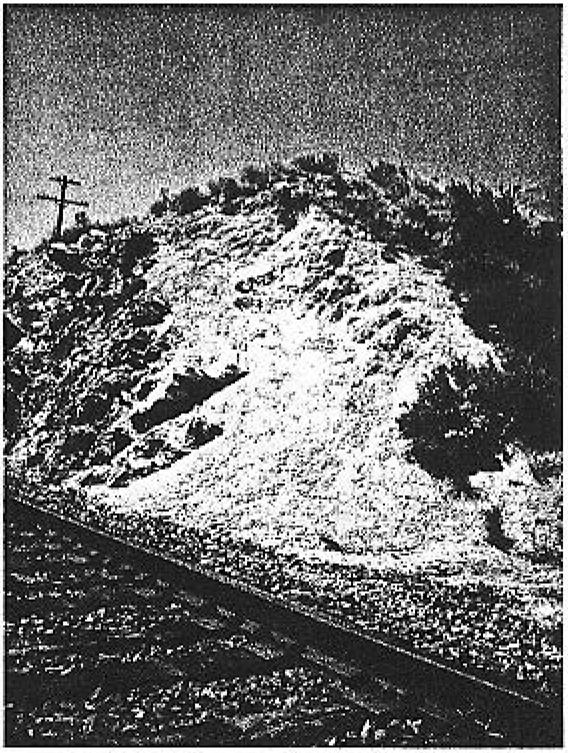
The old cement plant at Lime



Collecting area is on the near side of this mound between the access road and the railroad.



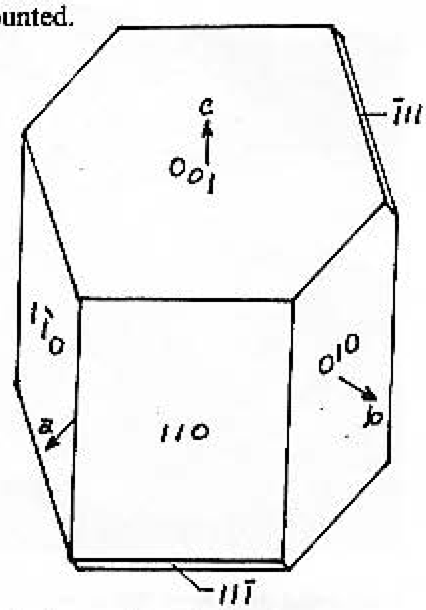
Dark dike as viewed from the railroad



Collecting area on the south side of the railroad

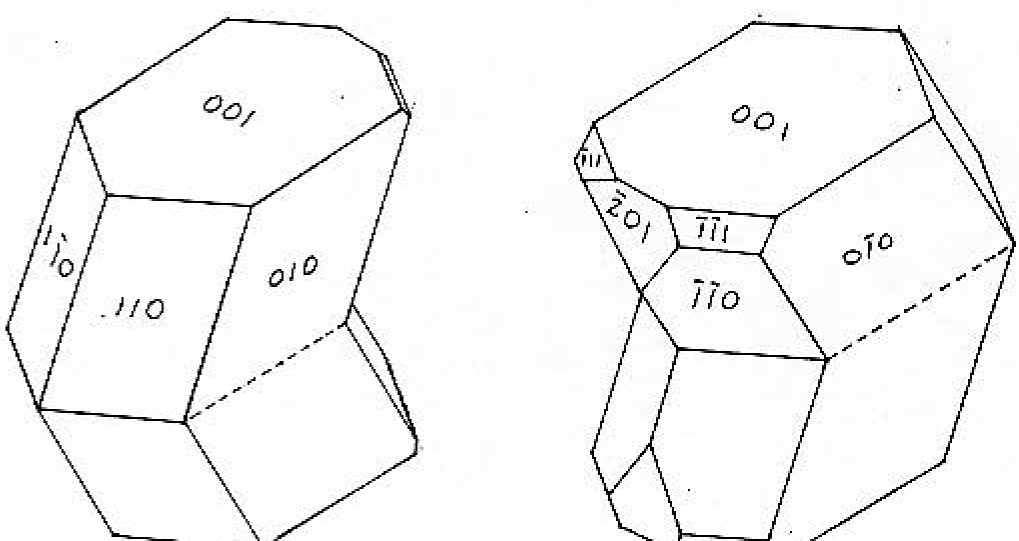
Well formed crystals weather out of the crumbly matrix and remain largely intact. The best collecting seems to be along the top of the mound left between the road cut and the railroad cut, or in the railroad cut itself on the western end. The crumbly dike has weathered into a spill of dirt and small fragments. By sifting through the debris, individual crystals can be picked out. These are typically up to about 1 cm in diameter and 2 cm in length, though some even larger can occasionally be found. Above the debris spills, chunks can easily be worked out of material that is still in place, though it is poorly held together and tends to crumble. Matrix specimens are not easy to keep together long enough to get them home and mounted.

Obtaining nice individual free crystals and twins out of the debris, on the other hand, is very easy, and an hour or two sorting through the bank of dirt will produce an ample supply of interesting crystals. Single crystals are the most abundant. They are composed of a large *c*-face together with a prism showing {110} and {010} so that they look like a slanted hexagonal prism, often with very minor {111} faces beveling the edges. Single crystals generally are elongated along the *c* axis.

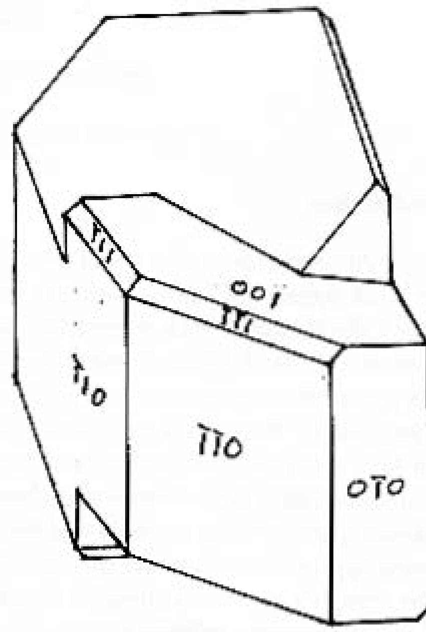


Single crystal habit of orthoclase

There are three kinds of twins that can be found at Lime: Manebach, Carlsbad, and Baveno. The most abundant of the three at this site is the Manebach twin. Here the twin plane is (001), so these crystals would be as if you stacked two of the single crystals on top of each other with the top one rotated 180°. Since the elongation in this case is along the *a* axis, the resulting crystal looks rectangular. One end is a pointed termination composed of four {110} faces. The other end, showing the reentrant angle, is modified with {111} and {201} faces as shown in the diagram below. The dashed line indicates the location of the twin plane. The faces of only one of the two crystals are labeled with their indicies.



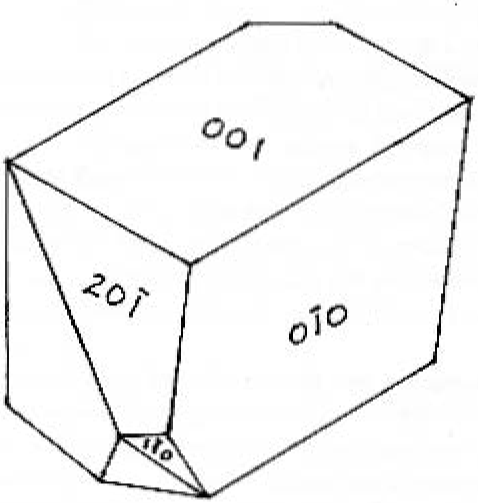
Two views of the Manebach twin. Miller indicies are given for one of the members.



A Carlsbad penetration twin.

Not as numerous, but still relatively easy to find, is the Carlsbad twin. In this type, the twin plane is the (100), but the two members are offset sideways so that the crystals are displaced in the *b* direction. Because the resulting twins seem to wrap around each other, these are referred to as penetration twins. Minor {111} faces usually bevel the top edges. Such a twin is shown at right, where once again the indices of one of the members are given. For the Carlsbad penetration twin, only one view is given because both ends appear the same. However, the front crystal can be offset to the right (as shown) or to the left.

The third type of twin, the Baveno twin, is common at other locations but rather rare at Lime. In this type, the twin plane is the (021). Because of the dimensions of the unit cell in orthoclase, this plane is very nearly 45° from both the (001) and the (010) planes, so that the resulting crystal would be again approximately square in cross-section, but with the two *b* faces next to each other rather than opposite (and thus the two *c* faces also next to each other). These twins also are elongated along the *a* axis. But since the twin plane is diagonal, the end face symmetry is quite different than that of the Manebach twin, as can be seen in the diagram at left. The major face is the (201), with minor (110) clipping a corner. The reverse end of the crystal is often rather irregular because of the reentrant angles present.



The Baveno twin

In addition to these, there are a number of crystals that show other twinning, parallel growths, or intergrowth that are always interesting.

This is an easy place to collect, requiring no equipment and readily accessible. If you are traveling east across Oregon on Interstate 84, I heartily recommend that you plan to stop for an hour and sift through the gravel along the road or railroad near Lime. You could easily turn up with a real treasure, and most certainly will find good examples of specimens that illustrate the twin laws in orthoclase.

Summit Rock Revisited

William S. Wise, Santa Barbara, California

(reprinted from the NCMA Newsletter, Spring, 2003)

Introduction

An early focus of a small group of people gathering at the home of Vi and Harold Frazier near Point Arena, California were the minerals from a quarry at Summit Rock, just north of Crater Lake National Park, Klamath County, Oregon. The group was to enlarge and become the Northern California Mineralogical Association, NCMA. My introduction to the group about 20 years ago centered on micro-crystals forming in cavities of volcanic rocks, particularly those from Summit Rock. Recently I examined a collection of specimens from Summit Rock that I inherited from Jean and Don Hall, active members of that early group, and I reviewed the paper by Kleck (1970) describing the minerals and giving his ideas on their origin. Because this locality still produces quality micro-crystals and because nomenclature has changed over the past 30 years, it seemed appropriate to review this locality and the minerals. Moreover, hypotheses on the origin of the minerals have also changed significantly from that given by Keck (1970). In this article I will use the igneous mineral terminology in Deer, Howie, and Zussman (1992) and Mandarino (1999).

The Summit Rock lava dome

Summit Rock is an andesitic lava dome, an extrusion of viscous lava that formed a mound about 60 m high and 200 m in diameter. The eruption of such domes is commonly preceded by the formation of a scoria cone, followed by the lava filling the crater and slowly expanding outward. In this case the conduit was 10 to 20 m in diameter, and the lava could not reach a height greater than about 60 m before flowing horizontally about 100 m in all directions.

With cooling all igneous rocks crystallize over a temperature range of about 200° C. As andesitic magma rises in the conduit, it begins to crystallize plagioclase and the two pyroxenes, enstatite and augite, at about 900° C. These minerals continue to crystallize as the magma rises and cools, and at about 830° C ilmenite and magnetite begin to appear. At this stage the lava is about 75% crystals and highly viscous. It was at this temperature that the Summit Rock andesite was extruded. As the lava expanded into the dome, gas (mostly H_2O, but with some CO_2) separated from the melt, forming bubbles, vesicles. Flowage of the pasty lava occurred mostly along shear planes, which in some parts of the dome were also the sites of vesiculation. As bubbles expanded, the crystals and remaining melt were pushed aside, forming smooth cavity walls.

In certain zones of the dome, crystal growth occurred into the vesicle and gash fracture free space, probably at temperatures between 700° C and 800° C. By studying the fluid inclusions in these crystals, Roedder and Stadler (1988) have shown that they grew from the gas phase that was flowing through the fractures and cavities transporting constituents from the pockets of melt to the growing crystal surfaces. The minerals forming the largest crystals are those for which there were abundant constituents left in the melt. The crystallization of the early-formed feldspar and pyroxene minerals, which contain Ca and Mg, enriches the remaining melt in Na and Fe. The minerals of the Summit Rock cavities are richest in these components along with others that had not yet formed any crystals, such as apatite. Crystals in cavities grew substantially larger than those in the rock and exhibit good crystal form.

The cavity minerals

The minerals in Summit Rock cavities occur in two suites: the enstatite-suite and the aegirine-suite. The enstatite-suite comprises those minerals common in most of the andesite rocks of the Cascade Range: enstatite, augite, plagioclase (calcic-albite), magnetite, ilmenite, fluorapatite, and zircon. This group of minerals is by far the more common in the Summit Rock lava dome. Aegirine-suite minerals have the same overall bulk composition, but were formed from highly oxidizing gas. Through fracturing of the dome, atmospheric oxygen was incorporated into the gas flowing through some of the fracture/cavity conduits. The suite consists of aegirine, plagioclase, cristobalite, tridymite, hematite, pseudobrookite, fluorapatite, phlogopite, and rarely cuprorivaite. Textures shoe that in some cavities, the aegirine-suite minerals formed as the result of oxidation of pre-existing crystals of the enstatite-suite, such as aegirine replacing enstatite.

Minerals of the enstatite-suite

ENSTATITE - Formerly the name *hypersthene* was applied to an intermediate member of the orthorhombic pyroxene series enstatite-ferrosilite. Current nomenclature uses only the end-member names. This mineral is an essential constituent of andesite, especially in the Cascade Range. In the Summit Rock cavities, enstatite occurs as transparent brown euhedral crystals, 2-3 mm long, elongated parallel to *c*. Although most crystals are blocky striated prisms somewhat falttened on {100}, some are very thin prisms. Crystals appear to be seeded by small crystals in the cavity wall and grow to ten times their original size into the cavity. Microprobe analyses show that the average composition is $Mg_{0.54}$ $Feo_{.46}$ Si O_3 , a *ferroan enstatite*.

AUGITE – This pyroxene in crystals less than 0.5 mm comprises about 25% of the rock, but is largely inconspicuous on cavity walls. The pale green crystals project only slightly into the cavities. Although it is an essential constituent of andesitic lavas, apparently there was insufficient Ca in the remaining melt for much further crystallization.

ALBITE – Colorless platy crystals of plagioclase feldspar as much as 3 mm long are a major constituent of the rock and cavity walls. The typical plagioclase twinning is commonly discernable along the plate edges. Microprobe analyses indicate that the appropriate name for this mineral is *calcian albite*.

ILMENITE – All cavities with the enstatite-suite minerals contain black metallic hexagonal plates of ilmenite up to 1 mm in diameter. Most crystals tend to grow with the edges projecting into the cavities, and are slightly altered, especially on the *c*-face. Ilmenite is distinguished from hematite by its weak magnetism and black streak.

MAGNETITE – While common in the rock, the magnetite crystals exposed in cavity walls have rounded surfaces, indicating that they may have been dissolving as other cavity minerals were growing. The surrounding feldspars are invariably stained red, probably from weathering.

FLUORAPATITE – Typically fluorapatite occurs as very thin colorless needles lying on cavity walls. Crystals are 0.01 mm thick and up to 0.1 mm long. Because this mineral formed last and is colorless, it is inconspicuous lying on colorless plagioclase.

ZIRCON – Rarely, cavities contain very small (about 0.3 mm long) pale pink terminated prisms of zircon. Originally thought to be rutile, the mineral was shown to be zircon by Huneke and Rossman (1978). Because these crystals are so small and light colored, they are easily overlooked.

Minerals of the aegirine-suite

AEGIRINE – The name *acmite* has been applied to the yellow prisms that occur in some zones at Summit rock. In current nomenclature (Mandarino, 1999) the name *aegirine* seems to be preferred. Aegirine occurs as single, long (up to 4 mm) or short prisms, and as parallel clusters where it epitaxially overgrows altered enstatite. It is associated with pseudobrookite, hematite, albite and cristobalite. Microprobe analyses show that two end members can express the composition: diopside $Ca\,Mg\,Si_2\,O_6$ and aegirine $Na\,Fe^{+3}\,Si_2\,O_6$. Composition of single crystals vary between 60% and 80% of the aegirine component. Aegirine from almost all other localities, such as from Mt. St. Hilaire, have compositions containing the hedenbergite $Ca\,Fe^{+2}\,Si_2\,O_6$ component as well as diopside and aegirine. Crystals of any mineral having both Fe^{+2} and Fe^{+3} are invariably deeply colored, either very dark red or brown. Therefore, the yellow color of crystals from Summit Rock indicated that only Fe^{+3} is present, which is quite unusual for this mineral.

PLAGIOCLASE – Crystals of plagioclase occur in all cavities and are typically about 1 mm across. Like in the enstatite-suite cavities the albite is colorless and transparent, and occurs as nearly square, blocky to platy crystals.

HEMATITE – Black hexagonal plates to irregular crystals of hematite occur in most cavities of this suite. The crystals are similar to ilmenite, but are smaller (0.5 mm), shiny with slightly rounded edges. Hematite commonly overgrows oxidized ilmenite. Hematite is distinguished from ilmenite by its red streak and non-magnetic properties.

PSEUDOBROOKITE – The habit of pseudobrookite crystals is unlike that seen in other localities, such as Topaz Mountains, Utah. Here the crystals are in the form of equant plates, flattened on {001}, and tend to form stacks on the {001} faces. Pseudobrookite is a common oxidation product of ilmenite. The color is distinctly reddish, and the luster submetallic.

CRISTOBALITE – Sparse but present throughout cavities with the aegirine-suite minerals, cristobalite occurs as milky white clusters of interpenetrating twins of octahedral crystals up to 2 mm across.

TRIDYMITE – More common than cristobalite, tridymite occurs as thin hexagonal-appearing plates 1 mm across or as twins, forming clusters of hexagonal plates. All crystals are colorless and transparent. Both tridymite and cristobalite represent the excess silica left after crystallization of other silicate minerals, and indicates either very rapid crystallization or temperatures too high for quartz.

FLUORAPATITE – Most of the apatite crystals in the aegirine-suite are similar to those in the enstatite-suite, *i.e.* thin and colorless. However, some pale yellow crystals have been found that are shorter and thicker prisms.

PHLOGOPITE – Very thin, almost colorless plates of phlogopite (0.5 mm across) occur in a few of the cavities of the aegirine-suite. Several specimens have been found with reddish-orange hexagonal plates of phlogopite about 0.3 mm across. The color is apparently from sub-microscopic hematite within the crystals, and probably indicates post-crystallization oxidation.

CUPRORIVAITE – A few specimens were found in the 1980s (I do not know by whom) that have sky-blue square plates of cuprorivaite scattered among albite and aegirine crystals. The cuprorivaite crystals are very small (about 0.1 mm across) and were identified by X-ray diffraction and optical properties. Apparently cuprorivaite formed by the oxidation of chalcopyrite, a common trace constituent of andesitic rocks.

Low temperature minerals

Several minerals occur in the cavities that are a result of weathering reactions, during the cooling of the dome and much later. Hyaline opal and chrysocolla are fairly common in some parts of the quarry exposure. Recently, Don Howard found distinct crystals of volborthite, recognized by the thin plates with the distinctive yellow-green color.

References

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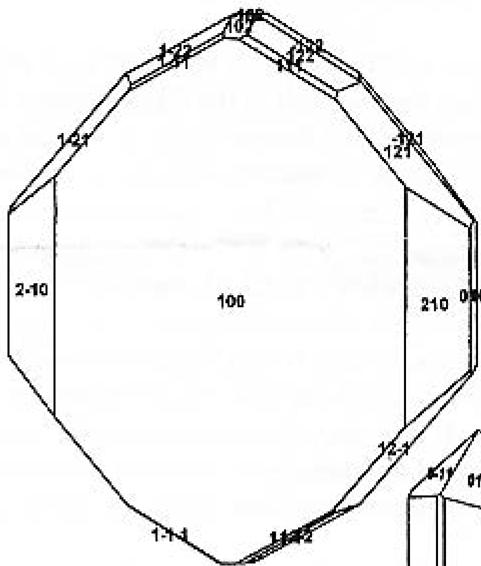

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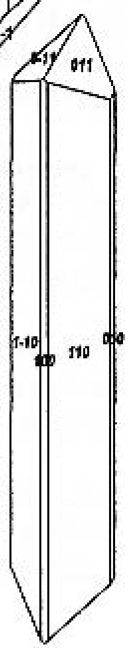

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Northwest Micro Mineral Study Group Meeting

Don Howard & Rudy Tschernich

So why are we meeting at a new place? After many ***good*** years at the PUD Building, the political climate has changed. Rules now are that the facility is for the use of Clark County residents only. We have very few members in Clark County, and none of them is in leadership.

In looking around, we realized that getting a room for free was a pretty rare gift. At the same time, it has been clear in the discussions at meetings that we intend to support the Rice Museum. So it became a natural thing to combine that support with our needing a meeting place. This means that in addition to our meetings, all our members will receive membership at the Museum and will be entitled to enter at any time it is open to view the exhibits and take part in the programs. We hope to be able to make a continuing contribution to the success of the museum.

Rudy writes the following about what to expect for our meeting:

Six-foot tables and chairs will be available to set up your microscopes and trading material. We will have less space than we had at the Clark County PUD building, therefore, please restrict your material to 3 feet or half a table. Tables for trading material will be outside under the breezeway or if weather permits, in the back yard. Zeolites collected in the 1960's by Sharleen Harvey will be put on the free tables.

The museum has an outdoor Kid's Rock Pile where school students visiting the museum get to pick out a special specimen to take home. We are always in need of additional specimens to add to the pile. Please bring along any crystals, cutting material, agate, petrified wood, ore minerals, fossils, or anything kids would like to be added to the Kid's Rock Pile. Material for the Kid's Rock Pile can be broken or trimmings. Please do not bring any dangerous minerals that contain mercury, arsenic, or asbestos.

We can use the kitchen and refrigerator to organize and store our food for our potluck lunch. Due to county restrictions we cannot use the stove or cook food at the museum.

Come to the museum for a day of fun, trading, talking, and sharing information. View the museum's minerals and see the progress on the new Northwest Mineral Building. The micro meeting will be advertised at the museum and visitors will be welcome to attend the meeting and listen to the programs.

Since gates to logging roads should be open for deer hunting in November, we will plan some sort of a collecting trip on Sunday the 9th to Wolf Point, Mill Creek, or some other site that we agree upon if the weather is acceptable.

The collecting trip to Summit Rock and Lemolo Lake during the summer was a great success for the three families that attended, and we are still in the process of sorting out and analyzing the things that we found. Material from that trip will be available on the free tables.