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THE PRESERVATION OF MINERAL SPECIMENS[1]

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A problem which frequently confronts a museum curator is the proper preservation of certain choice specimens of minerals. A long and costly experience has already taught him that if he would preserve crystals of ruby silver, he must keep them in the dark. A less expensive but no less disastrous experience has shown him that realgar is almost invariably ruined when exposed to the light. From other disasters he has also learned that his specimens of carnallite must be kept in a moderately dry atmosphere while certain others are completely destroyed in the same dry atmosphere. In spite of such experiences it is seldom that any special precaution is taken to prevent the destruction of material that has been obtained, often at great risk or great expense. In some cases it is impossible to duplicate the material.

This problem was presented to the writer in a very practical way during the past summer when a considerable quantity of laumontite was collected along the shores of the Bay of Fundy, and it seemed a question whether it could be preserved long enough to make a satisfactory examination of it if it were packed in the ordinary way. It was noticed, however, that with one exception the specimens of fresh laumontite were exposed only below high water so that it was decided to pack the specimens so as to keep them wet. Two kegs were packed, the specimens being wrapped in paper, and in the first keg sawdust was used liberally and when the keg was filled the whole was thoroughly saturated with water before the head was put in. In the second keg, for want of better material, fresh sea-weed was used as the packing material. In the same shipment was a box containing a few specimens of laumontite with

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which no special precautions were taken. Directions were forwarded to the museum that as soon as this shipment arrived an auger hole was to be bored in the head of each keg and a pint of water poured in each day. Before unpacking a number of glass jars were secured so that if the specimens were in good condition they could be preserved at once from any danger of the usual decomposition. When the material was unpacked it was found that the laumontite in the box had become white and chalky in appearance like most museum specimens of this mineral. The specimens in the kegs, however, were bright and showed no sign of disintegration. While both kegs of specimens were equally well preserved it was found that there is considerable difference in the desirability of the two packing materials. In the three months that intervened between packing and unpacking, the sea-weed had decayed and shrunk so that the keg was no longer full and for long journeys it would be utterly unsuitable as there would be grave danger that the specimens would be destroyed when some freight handler should roll the keg after the shrinkage had begun. In the case of the sawdust there was no shrinkage. In packing minerals wet it is necessary, in case there is not sufficient material from a single locality to fill a keg, to pack the specimens from each locality in a cloth bag, which can be identified, before putting in the keg, as all paper labels will be destroyed.

For such minerals as this it is desirable that a method be devised whereby they may be exhibited safely and conveniently. A museum jar with plane surfaces provides a receptacle in which the material may be preserved in water and in most cases even the transparent colorless minerals will remain visible because of their higher index of refraction. If the minerals were in an atmosphere saturated with moisture the same result, so far as the preservation of the specimen is concerned, would be attained, but the condensation of moisture on the walls of the cell would at times offer an impediment to easy vision. If the first method be used it is necessary to avoid the use of organic material as a support as bacterial growths soon appear under certain conditions.

The single specimen of laumontite that was found above high tide offers a possible solution to the problem. This specimen was in a dry cavity facing the north or north-west in such a way that the specimen was at all times protected from the sun's rays. The temperature probably never exceeded 55° Fahr. A room that never has a temperature greater than 55° Fahr. nor less than 33° Fahr. should provide conditions that would preserve nearly all minerals that suffer damage by loss of water.

The reverse problem is presented by such minerals as carnallite and other deliquescent chlorides. In this case the museum jar again offers a solution to the problem, but the specimen must be in a dry atmosphere or in some liquid from which the mineral cannot absorb water. In this case as in the last the stability of the mineral depends not only on the relative humidity of the atmosphere but on temperature.

A similar problem is presented by those minerals that melt at a comparatively low temperature. These rarely give cause for anxiety except in tropical climates, yet during the past summer a jar of mirabilite in the Royal Ontario Museum of Mineralogy melted in part, thus showing another type of material that should be preserved at a low temperature. Although few minerals actually melt in the temperature of a museum even in the tropics there are many particularly among the sulfides that oxidize under such conditions. The fumes evolved by a carload of pyrite on a hot summer day give undoubted evidence of oxidation which should be a reason for considering the temperature and light conditions that are necessary to preserve the sulfides. How far high temperature is responsible for the compounds that give rise to the beautiful tarnish on many minerals is a subject for careful investigation.

While high temperatures are in many cases disastrous, low temperatures may be equally injurious. Many a specimen containing liquid inclusions ceases to be an object of peculiar interest when the temperature has gone below the freezing point of the liquid.

It is of course evident to all that sulfur fumes and other active gases should not be permitted to invade a museum, particularly where it is desirable to preserve silver specimens. The brown and finally black tarnish that appears gives serious cause of mourning.

Light is one of the most serious problems. To the writer it is somewhat doubtful whether any mineral remains in its original condition after long exposure to light. The experience with the transparent silver compounds leaves little doubt that they are all eventually injured by light. A similar statement may be made for realgar and kermesite and some varieties of topaz. In the case of certain minerals exposed to the light of some of the newer electric lamps a beautiful fluorescence is frequently observed. In view of the changes in color that have been produced by ultra-violet rays, X-rays and radium emanation it is by no means improbable that serious color changes are brought about slowly by other light waves. The problem becomes more complex when we try to store radio-active minerals with those that are noticeably sensitive to radio-activity.

It may be argued that if it is necessary to keep minerals in the dark it will be impossible to have a public museum. It must be remembered, however, that a museum of mineralogy is not primarily a place for display but a laboratory and store-house where investigations go on and material is preserved for future research. If material cannot be displayed without being ruined it is the curator's duty to see that the specimens shall only be viewed under conditions that will ensure their preservation. No one with the simplest knowledge of photographic chemistry would dream of opening a box of dry plates in broad daylight. Why then should the museum curator display cerargyrite to the public? The only excuse is that the specimens are all ruined before they reach a museum. If we look upon the prime object of a museum to be not display but preservation of priceless material it then becomes possible to outline conditions for attaining our object. If we know the conditions under which minerals are formed and can duplicate those conditions we can be certain that in most cases the mineral can be preserved. With increased knowledge of the vapor pressure of minerals it will be possible to provide conditions under which they will remain stable.

It is not the intention of the writer to indicate the conditions for the preservation of all minerals. If, however, he can stimulate a study of these conditions so that at some time he may see well-preserved crystals of the sulfates of iron without having the drip of mine water about him he would feel that a decided advance in museum methods had been made.

The following lists include some of the minerals that are injured to some extent by the causes indicated:

Loss of Water

Quartz (fluid cavities)
Halite (fluid cavities)
Natron
Pirssonite
Gaylussite
Lanthanite (?)
Trona
Hydromagnesite
Lansfordite
Laumontite
Borax
Epsomite
Goslarite
Morenosite
Boothite
Melanterite
Chalcanthite

Exposure to Light

Realgar
Pyrargyrite
Proustite
Pyrostilpnite
Tetrahedrite (?)
Xanthoconite
Cerargyrite
Embolite
Bromyrite
Iodobromite
Iodyrite
Huantajayite
Amethyst ?
Smoky quartz
Rose quartz
Topaz

Absorption of Water

Halite
Huantajayite
Hydrophilite
Chloromagnesite
Lawrencite
Scacchite
Molysite
Bischofite
Kremersite
Erythrosiderite
Douglasite
Carnallite
Tachhydrite
Soda Niter
Niter
Nitrocalcite
Nitromagnesite
Nitrobarite
Gerhardtite
Darapskite
Nitroglauberite
Kainite
Nesquehonite
Thermonatrite
Melanterite

Exposure to Radioactivity

Diamond
Spodumene

Oxidation

Alabandite
Polydymite
Marcasite
Vivianite

Tarnish (in part by oxidation)

Arsenic
Bismuth
Silver
Copper
Lead
Iron
Stibnite
Bismuthinite
Dyscrasite
Domeykite
Temiskamite
Chalcocite
Pyrrhotite
Bornite
Chalcopyrite
Stannite
Smaltite
Cobaltite
Gersdorffite
Berthierite
Enargite

Rapid Change in Temperature

Sulphur

Volatilization

Sal-Ammoniac
Teschemacherite

Melts at Low Temperatures

Mirabilite