How To Clean Rocks and Crystals

Presented by Daniel Nichols, CCGC Board Member

1. Mechanical cleaning methods for quartz crystals

To a certain extent your cleaning method will depend upon how much quartz you have to clean. If you are running a quartz mine in Arkansas or digging amethyst from the decomposed basaltic soil near Artigas, Uruguay, you will likely have pick-up trucks full of quartz to clean. In this case the first thing you need to do is to use water to clean them up as much as possible. If your specimens are heavily coated with mud, like the amethyst dug from the basaltic soil near Artigas, the best way to start is to place the specimens on the ground(concrete or asphalt preferred) or perhaps on rectangular screens nailed to 2x4 foot wooden frames. Blast them with water using as much pressure as you can manage. Water from a hose is OK, but that from an electrical or gas powered pressure washer is better. Don't use too much pressure or you will damage them by blasting them into one another or cause them to roll them around on the ground, causing them to chip and crack. I have heard of some people who don't have a pressure washer taking taking their specimens to one of the coin operated car wash places and used the pressure washers there to clean their specimens. If the specimens have a lot of thick mud on them, after the first wash they are left to dry out. This will usually cause the remaining mud to crack and shrink and allows subsequent washing to remove more of the mud. This process is repeated until it is clear that repeated washing and drying cycles will be unproductive. If you have only a few specimens to clean, just scrub them up with a brush and soap and water or use one of the little fabric high pressure cleaning guns described below to clean off as much dirt as you can.

After you have removed as much of the gross dirt/mud as you can and feel that the specimen(s)need further cleaning, examine it closely and scratch at any remaining "dirt" with a knife blade. See if you can dislodge the offending material. Use the point of the blade if you have to. Don’t worry about hurting the quartz crystal since it is much harder than the steel of your knife. Worry instead about the blade slipping and cutting your hand. Ideally, you will want to do this under a binocular, reflected light microscope, but a magnifying glass or sharp eyes may serve as well. You do this so you can see exactly what happens when you scratch the crystals face and if you are really making any progress in removing the offending coating. Don’t be afraid to really go after it. If you can scrape any part of the surface clean at all, even if it is only in a tiny area, there is a good chance that you will be able to clean the quartz mechanically. If you can’t scrape any of the surface clean, then it is likely that the surface of the quartz has been naturally etched or the offending material is intergrown into the surface of the crystal or has been included just beneath the surface. If the material you would like to remove is intergrown with the surface of the crystal or included just below it you are sunk and there is not much you can do to improve the specimen short of grinding away the surface and polishing it using normal lapidary procedures. These lapidary procedures are generally labor intensive and you can’t just “buff up” the crystals and make them shine like you can do with brass or copper. I know of no chemical method that makes a dull quartz

crystal shiny. Well, wait! I should not say that. I have seen formerly quite unattractive quartz crystals that have been put in the big, heated stainless steel autoclaves full of concentrated alkali solution that are used to grow synthetic quartz and afterwards new quartz has been grown on top of these crystals and they look quite nice. But, that is the only exception I know about. If you can't make a dent in what it is you want to remove with the point of a knife blade there may yet still be a tiny shard of hope left, but I'll discuss that below. This will be for the real diehards who know something about chemicals and how to use them safely.

2. Soap and Water To clean quartz specimens a first good step is to scrub up one or two of them them with soap and water. Use liquid detergent soap, if you can, rather than some other kind and warm water. This will remove any easily removable dirt and can can often give you an indication of how to proceed. If your detergent is the kind that has perfume or lemon scent added, your specimens will have the added virtue of smelling nice. Often, experienced cleaners will skip this step and proceed to blasting their specimens with high pressure water using fabric guns to see if that will remove the offending substance. The easiest way to do that is to buy one of the little handheld cleaning guns called fabric cleaning guns. They are commonly used in the dry-cleaning industry for removing spots from fabric. You can buy these for less than $75. If you Google "spot cleaning gun" you will find a lot of these offered for sale. These little “buzzer guns” used to cost several hundred dollars and still many dealers bought them, because they cleaned specimens so wonderfully and made the dealers so much money. Often, knowledgeable collectors and dealers still often pick up old specimens that were not cleaned well because the dirt was down in the cracks and their former owners could not clean them well with soap and water and a scrub brush. Frequently five minutes or less working on them with one of these new little fabric guns will will increase the value of a fine old specimen by hundreds or even thousands of dollars. The appearance and availability of these little cleaning "guns" has been revolutionary for those who want to clean specimens. Its impact on cleaning minerals is like the difference between copying a book by hand using a quill and ink compared to printing it with a laser printer.

These little "guns" have a short barrel. Just below is a bulb like plastic reservoir that the user periodically unscrews and fills with water (hot and soapy if you wish). When you pull the trigger on these handy little devices, a little spring driven piston hammers rapidly back and forth and forces small but powerful jets of water out of the nozzle. It looks continuous but in reality it is intermittent. If you put your finger directly in front of the nozzle, the stream is often powerful enough to drive water under your skin, but the force of the stream quickly diminishes with distance from the barrel because of turbulence. A yard or so from the nozzle, the stream turns into a mist. You can quickly get a feel for just how much force you are applying to the specimen by holding your hand as far away as you can from the nozzle and then bringing your hand closer. Pretty soon you will feel the water stream against your hand and when you come close enough, it will start to sting. It is a good idea to stop at that point. By doing this little exercise you can quickly tell how far away from the specimen you will need to hold the gun to apply the amount of force you want. You will commonly hold the "gun" in one hand and the specimen in

the other. With quartz, you can usually blast away to your heart's content. You may need to be careful with delicate specimens having many tiny thin needles of quartz because, if they are not firmly attached to the specimen, you can sometimes blow them right off. You will find, however, that crystals are often tougher than you might think. Once you gain a little experience, you will find you can scratch at your quartz with the point of a knife and know if it can likely be cleaned with high-pressure water.

When you use these little spot cleaning guns you should use something to protect your eyes. I find that the glasses I usually wear are sufficient to protect my eyes from the little bits of rock and dirt that the spot cleaning gun blasts off of dirty specimens. However if you don't wear glasses, protective goggles are in order. If you are going to be cleaning a number of specimens you will also find that a plastic rain coat will keep your clothes from getting wet and having a lot of tiny bits of rock and dirt blown onto them. I have sometimes used them near my kitchen sink and later found that bits of rock and dirt have been liberally scattered over the sink, counter tops, splash boards, walls and windows, and what ever else is near by.

Sometimes the high-pressure water will only partially clean the specimen and to finish it you may need to switch to a somewhat more aggressive mechanical cleaning method, namely using an air abrasive tool. Usually however, if we judge that the coating is really tough to scrape off we will skip the high-pressure water and go directly to one of our air abrasive units.

3. Air Abrasive Tool Cleaning and Air Scribes.

If blasting your quartz crystals with high pressure will not remove the offending material, there is yet another mechanical means of cleaning that will almost certainly work, providing of course that you could scrape away a bit of the offending material with a knife blade as described above. This is by using an air abrasive tool. Some people call these sand blasters. These operate by directing a stream of high-pressure air that carries an abrasive medium against the specimen. The abrasive material acts like a scouring powder to remove or abrade away what it is directed against. The trick is that you need to use an abrasive medium that is less hard than the material you are trying to clean in order to avoid damage to the specimen. With quartz I recommend you use tiny glass beads rather than quartz or garnet sand. The glass beads will not visually damage the surface of a quartz providing that the air pressure is not to high and that the glass beads are relatively clean and do not contain to many sharp of broken glass or other hard impurities. Quartz or garnet sand will usually remove the shiny surface of quartz crystals and leaving dull. If you do not have access to an air abrasive tool, see if one of your local garages or metal working establishments has one that they use to clean spark plugs or debur metal parts and see if you can borrow some time on it. But make sure that you don’t use anything more aggressive or harder than glass beads. Start out with about 60 pounds of air pressure and increase if necessary. Often you can clean up small specimens of quartz (hand size) in a few minutes with this kind of equipment. Air abrasive tools are commonly used with different kinds of abrasive powders to clean and

prepare fossils. We have used large and small versions of this equipment for years with different kinds of abrasive media and they have paid for themselves many times over.

If you don't have access to this kind of equipment, you can do it the old fashion way and just keep scraping away with hand tools. Used dental picks make wonderful tools for this type of work and little hand electrical grinders like flexible shaft tools can be handy. But no matter how much time you spend cleaning your quartz by hand, the results will rarely be as good as you can obtain with air abrasive equipment and it will take you ten to a hundred times longer.

Another modern tool that is often handy when "cleaning" quartz specimens is an air scribe. This is a little miniature hand held jackhammer powered by compressed air. They look a little bit like fat pencils and can be used to help shape your specimen or to remove chunks of offending material that may be growing on your quartz crystals. If you take enough time with the air abrasive tool, you can often remove large thick masses of material, but often an air scribe will remove it in seconds rather than minutes or hours. Air scribes are also commonly used to remove saw marks from specimens that have been trimmed to size by diamond saw blades. We have some made by Chicago Pneumatic. There are different kinds, some designed to remove small amounts of matrix, and others that will remove a great deal more.

4. Ultrasonic Cleaners

Before the advent of fabric guns, ultrasonic cleaners were often the cleaning device of choice to clean specimen. These cleaners come in various sizes from those that hold a small cupful of cleaning solution, usually water with a little detergent soap in it, up to giants you could almost take a bath in. Usually they are made from stainless steel and are driven by transducers of piezoelectric materials like lead zirconate titanate (PZT), barium titanate, etc) but are sometimes made from magnetostrictive materials glued to the exterior walls of the tanks. They strongly vibrate the cleaning solution and this causes tiny bubbles to form (cavitation) and the collapse of these micro bubbles creates a lot of energy and cleaning action. In the larger, more powerful models, the water will heat up as you use the device and this also enhances the cleaning process. The material to be cleaned is suspended in the tank. If you put specimens on the bottom of the tank, this will often reduce the cleaning effect, sometimes dramatically, because it reduces the amount of cavitation and therefore the cleaning efficiency of the unit. Often cleaning will take place within a few minutes. This device, however, is usually not very good at cleaning a lot of dirt out of deep cracks or below overlapping crystals or specimens with a lot of dirt or well consolidated dirt. Also, larger units are sometimes quite noisy and some emit a high pitched squealing sound that is quite penetrating. The good units, and those large enough to hold larger specimens can cost several hundred to several thousand dollars each. We quickly discontinued the use of these units soon after we got our first fabric guns.

Chemical Cleaning

Perhaps the most common reason people want to clean quartz is to remove brown “iron stains”. These “iron stains” are caused mostly by two iron oxide minerals: hematite and goethite. They are usually a rusty brown color but can manifest a range of colors from black to red. The term limonite is often used to name them collectively. There are a number of other minerals that lie in that color range and may require chemical treatments other than those discussed below. A lot of this offending material can be removed by mechanical means, often easily with high-pressure water or by use of an air abrasive tool. But if the collector does not have access to these devices he often hopes for some magic liquid that he can dip his specimen into that will remove the offending material. I think that the success of some commercial cleaners like Tarnex (a silver cleaning solution) where the user dips tarnished silver into the solution and, magically, the silver becomes bright, is the root cause of this desire. For cleaning quartz, no such magic solution exists.

If you have “iron stained” quartz crystals, blasting them with high-pressure water and/or an air abrasive tool will remove a lot of the iron staining, but almost certainly some of the staining will remain down in the cracks. To completely or almost completely remove it, you will need to use chemicals. Before you use chemicals, I would suggest you clean the specimen as well as you can with the above methods. This will allow you to chemically clean your specimens more quickly and use a smaller amount of chemicals to do so. There are three main ways to chemically remove “iron stains” from quartz. They are by the use of: 1. A Waller solution (Iron Out), 2. Oxalic acid, or 3. Hydrochloric acid. These three chemical methods will remove “iron stains”: (hematite & goethite). I should state that at this point that it is almost impossible to remove well-developed crystals of hematite and goethite with the chemicals discussed below as these chemicals are effectively only in removing the fine-grained equivalents of these minerals.

These three chemical reagents are helpful in removing hematite (iron oxide) and goethite (iron hydroxide) specifically, so if your “iron stains” are caused by other minerals, these three chemical methods may not work for you. If you know exactly what offending minerals are on your quartz specimens and have some knowledge of chemistry, then the choice of chemical cleaning agents is much more clear-cut. Ideally, a person wanting to clean some quartz specimens would analyze the offending “dirt” and find out exactly which mineral(s) comprise the “dirt” and would then pick the appropriate chemical cleaning method. In practice it is usually easier to experiment with easily available chemicals than go to the trouble of doing the required analysis that is often not simple or straightforward, especially when dealing with fine-grained mixtures of various minerals. So, since the nature of what you want to remove may be in doubt, the best advice I can give you is to try one of these three chemical reagents on a not very valuable specimen and see if the reagent you choose will accomplish what you want.

5. Waller Solution (Iron Out)

If you decide to use chemicals to clean your quartz, I would definitely recommend that you first try using a Waller solution because (1.)the chemicals in this solution are usually not difficult to obtain at least in the United States and more importantly (2.)are generally less harmful than oxalic or hydrochloric acid. The Waller solution is a buffered solution of sodium dithionate. Easier than buying the chemicals and mixing them yourself, you can buy a product from Wal-Mart called Super Iron Out. You buy it in plastic bottles. It is a fine white powder and you mix it in water according to the directions on the bottle. If you don't have a Wal-Mart near you, have someone who does buy some and send it to you. You can also Google the name, Iron Out, or use http://www.summitbrands.com/summit/ [Link Broken? Nov 2014] and buy some through the mail. Maggie Wilson, one or our regular Mindaters informs us that in the United Kingdom Iron Out is known as Rust Out and is distributed by Aqua Cure, Telephone: 01704 516916 Website: www.aquacure.co.uk. Address: Aqua Dosa, Southport, England PR90SE

Sometimes "iron stains" work their way deeply into cracks in quartz, and you may have to soak your specimen for days or weeks for solutions of chemical reagents to dissolve and remove the stains. There may be the rare case where you are unable to remove them all. A solution of sodium dithionate is not very stable because it reacts with atmospheric oxygen. Therefore you should not expect it to be useful after a few days. We have switched over to this method of removing iron stains almost exclusively from other chemical methods because it is quick and easy and we do not have to neutralize it when done and disposal problems are minimal.

Franklin Roberts, from Austin, Texas, a knowledgeable Mindat regular provides us with the following useful information for people who wish to make their own Iron Out solution. This may prove especially useful for those who live in countries where it is not possible to buy a commercially available cleaning product like Iron Out or Super Iron Out.

Recipe for making a Waller solution:
33g sodium dithionite also known as sodium hydrosulfite
28 g $NaHCO_3$ (sodium bicarbonate)
59 g sodium citrate
Add about 800 cubic centimeters/milliliters of water, swirl it around until the chemicals dissolve and add enough water to make up a liter in volume.

If you would rather make a gallon of the solution, just multiply everything by four. It works slowly at room temperature and faster if heated, but don´t go beyond 60 °C. The other compounds beside the dithionite are for buffering/complexing reasons and may prevent precipitation of a dark greenish black coating (pyrite) on your specimen(s).

The MSDS (Material Safety Data Sheet) lists the active ingredients of Super Iron Out as:
Sodium Metabisulfite 20-65%
Sodium Hydrosulfite 20-65%

In this case, the prefix "meta" which is Greek for "after" refers to the fact that the metabisulfite is the species that comes after sodium bisulfite (dithionite) in the chain of oxidation products going from sodium dithionite -> sodium metabisulfite -> sodium dithionate. These three compounds are also known as sodium hydrosulfite, sodium pyrosulfite and sodium bisulfate, respectively. Pretty confusing, isn't it? The reason that super iron-out lists a wide range of percentages for the two ingredients isn't because they don't want you to know how much of each is in their product; it's because they don't know themselves. The actual ratio is a moving target. Remember, pure sodium dithionite is a potent reducing agent capable of snatching two atoms of oxygen from the air, water or anywhere else it can get them. As soon as it snatches the first oxygen, it becomes sodium metabisulfite and can only grab one more oxygen atom before becoming the fully-oxidized sodium dithionate, which is useless as an iron oxide reducing agent. However if you have a swimming pool, it is great for lowering the pH. Products such as super iron-out usually are made from industrial grade chemicals that contain a lot more impurities than the reagent or high-purity grades. The reason for using this feedstock is that the industrial grade chemicals sell for a few dollars a ton, while the pure stuff can cost a few dollars a pound. If all you want to do is remove iron stains from your driveway (or your minerals) industrial or technical grade will work just fine. The feedstock used to make super iron-out probably started out as a moderately pure sodium dithionite (hydrosulfite), but during manufacture and storage, it gradually absorbs oxygen from the air and some of it is oxidized, becoming sodium metabisulfite (pyrosulfite). Since the pyrosulfite is still a good reducing agent, it's OK to leave it in the mix, but it's nearly impossible to get an accurate estimate on the proportions. As time goes by, more of the dithionite will transform into the metabisulfite and then to the dithionate. Eventually, the entire batch will degrade into a solution of sodium dithionate and its days as a stain remover are over. That's why it's so important to keep the container sealed and away from the air as much as possible.

6. Oxalic Acid

The use of oxalic acid in cleaning quartz crystals.

Whatever you do, I would advise you to use Iron Out as described above before you use oxalic acid. Oxalic acid is a poisonous white crystalline powder that is dissolved in water and has the ability to dissolve various fine grained iron minerals and clean your brown quartz. Oxalic acid is the toxic substance that makes rhubarb leaves poisonous to eat. For many years it was, and sometimes still is, sold in hardware stores for various purposes, perhaps the most common of which was to bleach wood. When you work with this chemical you should wear plastic gloves and make sure not to inhale its dust or get any in your mouth. Don’t leave solutions of this material lying around because they are poisonous. Before you start, go to Wikipedia on the net and read what it has to say about oxalic acid. Be sure to use technical or industrial grade because it is much cheaper than purer grades and will work just fine for cleaning your crystals. It is best that this chemical is used in plastic or ceramic containers and not metal ones, because the oxalic acid will attack most metals. You can get away with using an iron container like a 55 gallon drum, but the acid will gradually eat it up and generally make a mess. To give you a good idea what you are faced with, a pound to a pound and a half of oxalic

acid in a five gallon bucket of water will make a good solution for cleaning quartz. The oxalic acid will take a few minutes to dissolve and you must keep stirring until it does. If you use warm water it will dissolve faster. Oxalic acid was used for many years to clean quartz in Arkansas and is still the chemical of choice among the miners who clean large amounts of quartz. They use big steel tanks made from T1 steel that they heat with gas burners, almost to boiling. In this way they can clean large quantities of quartz crystals overnight though sometimes the specimens need a second run through the acid to clean them completely. They buy their oxalic acid (mostly of Chinese manufacture) in big bags by the pallet full. This has proved to be the most economical way they have found to clean their quartz.

Most small time diggers who need to remove iron stains from specimens have switched over to high-pressure water and Iron Out. When you have finished cleaning you specimens with an oxalic acid solution you should not throw it down the drain. You can neutralize any remaining oxalic acid in solution with limestone chips, which will produce a white relatively insoluble precipitate of calcium oxalate, one of the components of many kidney stones. Most people who use this chemical just keep the used solution around to use again and occasionally add more oxalic acid as needed. Some let it evaporate to dryness. I have used oxalic acid on many occasions to clean “iron stains” from quartz crystals and crystals of the blue variety of microcline called amazonite. If you want you can heat it up and this will cause your specimens to be cleaned faster. I have done this in crock pots and stole the first one from my kitchen! An alternative to applying electric or fired heat is that you can put the oxalic acid solution in black containers or cover the containers in black plastic and let the sun heat the solution for you. If you use a plastic container you can heat these to about 55 degrees centigrade before they soften and start to deform. Fifty five degrees centigrade is just about as hot as you hand can stand and still remain on the plastic without undue pain. Covering them with black plastic in the sun should not cause them to deform. A rule of thumb for chemical reactions is that for every 10 degree centigrade increase in temperature, the reaction rate will double. When your specimens are clean, you should rinse them off and let them soak in clean water for a few hours. You may want to repeat this rinse process several times. Soaking overnight is good. Sometimes, if your quartz specimens have calcium or iron bearing minerals on them, or the water you are using has a lot of calcium or iron in it, it will cause calcium or iron oxalate to precipitate out of solution and coat your specimens with more crud you will then have to clean off with hydrochloric acid.

7. Hydrochloric Acid

Hydrochloric acid, or muriatic acid or “pool acid” is hydrogen chloride gas, HCl, that has been dissolved in water. It is sometimes been used to clean quartz, but the methods above are better, safer and less trouble. But if you don’t have them, you can use hydrochloric acid. Before you try and use this acid, go to Wikipedia on the net and read what it has to say about this acid.http://en.wikipedia.org/wiki/Hydrochloric_acid You can buy this acid in hardware stores and in places like the home depot. When you handle hydrochloric acid, you should use rubber gloves and eye protection and should NOT

use it in a confined area like your home or garage. There should be plenty of ventilation. You should also have a garden hose handy that you can use to flood any accidentally spilled acid with lots of water. Hydrochloric acid is a strong acid and must be treated with respect. The concentrated hydrochloric that you get at the hardware stores is rated at about 32% and gives off a strong acidic vapor. Do NOT stick you nose into the mouth of the bottle and try and smell this. You will smell enough of it just pouring the concentrated acid out of the bottle. Holding your breath is a good idea. Use a plastic or ceramic container to clean your quartz. Plastic is much better because it is not as breakable. Make sure you have a tight fitting cover for your container. Do not use metal containers when working with this acid. Put your quartz crystals in the container and pour in hydrochloric acid to cover them. Because of the fumes this acid gives off, make sure you cover your container. Periodically examine your quartz crystals to see if they need to remain in the acid longer. It is not advisable to heat this solution because of the fumes this will cause. BE SURE NOT TO USE YOUR BARE HANDS AND USE EYE PROTECTION. When it looks like your quartz crystals are clean, remove them from the acid and rinse them off with water. Then put them in another container of clean water and let them soak for an hour or two. Soaking them overnight will not hurt them and is a good idea. You do this to remove any acid that may have been trapped in the cracks of the specimen. If the specimen has many cracks or is composed of a porous material, you may have to leave the specimen in the rinse water for several days, and soak it several times in clean water so that all the acid has been removed from the specimen. If you do not completely remove the acid from your specimen, it may turn yellow at a later date and you will have to repeat the acid treatment and the neutralization. When you are done you can store the solution for future use or neutralize it. You will not want to store hydrochloric acid or solutions of hydrochloric acid long term in your garage or anywhere near metal. Plastic bottles of hydrochloric acid have a habit of eventually cracking and leaking. The solutions tend to give off hydrogen chloride which is hard to contain and it will rust up every bit of iron anywhere near the stuff. I would recommend not storing it more than a week or two if you can help it. You can use limestone or marble chips to neutralize the acid. When you put limestone or marble chips (calcite) in the acid, it will bubble and froth while carbon dioxide gas is liberated. When you add more limestone and no more bubbling happens, then the solution is neutralized and you can dispose of it. Dilute hydrochloric acid is what your stomach uses to digest food. If you spill some acid on the floor or your clothes, just flush the area or your clothing with lots of water and, just to be sure that the acid is gone, you can pat down the area with bicarbonate of soda. If no fizzing takes place or the fizzing stops, then you have successfully neutralized the acid. When working with this acid and accidentally spilling some on my hand or skin I will flush the area with lots of water and then taste the area. If there is any acid left on your skin, you skin will taste sour. If it does you will need to wash the area some more and perhaps pat it down with bicarbonate of soda to ensure neutralization. Tasting of other chemical reagents is definitely not recommend because they can be poisoners or even deadly. Old chemical texts used to tell you what various chemicals tasted like because this was a very fast and easy way to give you an idea of what chemical you had. Some chemists poisoned themselves.

8. Phosphoric Acid
You can also use phosphoric acid to clean out iron stains, but usually the cost of this acid is greater and it takes a bit longer. I don't recommend you use this method. Sometimes using this method will cause phosphate minerals to precipitate on your specimens, and those are often very difficult to remove.

Cleaning amethyst specimens from Thunder Bay, Canada.
Chemicals can be used to remove thin films of iron oxide minerals that are commonly present on amethyst specimens from Thunder Bay. However at this locality the iron oxide minerals can be quite thick and removing them with chemicals present chalenges not found on quartz from other localities. Chemicals are used to clean these specimens but it is not as easy as cleaning specimens from other localities and a time consuming task. The reagent mixtures can include both hydrochloric acid and oxalic acid and heat. The formulas for the reagents used are proprietary and are arrived at only after considerable experimentation. Since they confer an economic advantage on the miners that use them, they usually don't want to give up the cleaning methods that have made them money over the years. If someone would care to share detailed information about cleaning these kinds of quartz specimens we would be delighted to relate them here.

9. Cleaning Quartz with commercially prepared reagents containing small amounts of bifluoride.
Here is a quartz cleaning technique that was suggested and documented by Mindat member Nik Nikiforou that appears to be so practical and good we are presenting it here for all Mindat members. If you are familiar with the way specimens look, especially quartz crystals look when they are freshly collected from a pegmatite pocket you will want to be aware of this method of cleaning them, especially if you don't have any air abrasive tools at your disposal. Even if you do, you may want to give this method a try. Look at this before and after image of this quartz and spodumene var. kunzite specimen below. Although the before picture is not very sharp and not taken from exactly the same position as the after shot, it is plain to see that the cleaning of the specimen was very effective.

"Cleaning the above specimen with Whink took me about three weeks using three complete cycles, to get the piece to where I was satisfied that I had done enough. Note that even though most of the white stuff came off the quartz crystal, it was still extremely "luster challenged" after cleaning. Nonetheless, I am quite pleased with the results (although I have also messed up a few pieces as well).

Although you can probably prepare a similar reagent using ammonium hydrogen fluorite (ammonium bifluoride, a white poisonous powder) we would recommend you use a commercially prepared reagent called Whink. This is one that should easily be obtainable here in the United States. There are probably others. Perhaps someone will come forward with a formula and reagent preparation procedure for a similar reagent, but till then, this one will do well. For those of you in foreign countries who may not have access to this particular brand of bifluoride reagent I would advise you to ask or pay an industrial chemist to whip up a formula for one that you can use and perhaps even sell

to others that may want to clean their quartz specimens. But for now, lets listen to what Nik Nikiforou says:

I've had good results removing the silicate "white stuff" from Quartz and other minerals using an easily obtained product called Whink Rust Stain Remover. It is a liquid and comes in a brown plastic bottle in 6,10,16 & 32 oz sizes and can be bought in many hardware stores and or on line. Before I go any further you need to know that this product contains 2% to 3% hydrofluoric acid, one of, if not THE most corrosive acids known, and extreme safety precautions need to be taken, including working with it ONLY OUTDOORS, wearing SAFETY GOGGLES and chemical resistant GLOVES. You must NOT let the liquid touch your skin and you must not breath the fumes. I can't stress that enough.

Having said that, I use it by putting the specimen to be cleaned in a LOOSELY covered plastic container (not glass as it will eat through glass!), pouring enough of the liquid in to cover the specimen, and keeping it out in the sun for several days or longer. If I need to process a large piece I will dilute it with enough water to cover the specimen, although this will prolong the amount of time needed for it to work. I will check it every couple of days by gently scraping at the white stuff to see if it has begun to soften. At that point I will remove it from the Whink and soak it in water for a few days, changing the water daily, in order to remove any remaining HF, especially if the piece is at all porous. I then gently scrape off as much of the stuff as I can with a dental tool or knife, and if the piece can physically stand up to it, hit it with the water gun. I often have to REPEAT this process two or three times (Whink treatment, water soak, mechanical removal) to get the last of the white stuff off. A lot of work, so it only pays to do this with better pieces.

CAVEATS:
1. This is not the cheapest way to use HF - you can get more bang for your buck by using HF obtained from chemical supply houses, which is much more concentrated and can be diluted to your needs. This is NOT an option for me or for most collectors - I have seen photos of the severe tissue damage caused by even short exposures to this acid and don't want it anywhere near me.

2. Whink can DULL the shine on Quartz and other silicates if used for a prolonged amount of time. It will also destroy some other minerals (don't use it on Apatite!), and it will slowly begin to etch Feldspars and Micas. Do some research or test on lesser pieces first.

3. Getting the white stuff off often does NOT improve the appearance of the specimen. In my experience, most crystal faces that are under the white stuff tend to be dull anyway; this is one of the reasons that the white stuff is so tenaciously attached to the crystal as it has lots of microsurfaces to "get a grip" on.

4. I've had a couple of cases where the specimen either lost some crystals or came apart because the "white stuff" was actually holding it together. You need to closely examine your specimen to gauge if this is likely to happen.

If you plan on using Whink PLEASE TAKE THE PROPER SAFETY PRECAUTIONS! [Nik Nikiforou 2009]

In Brazil, the dealers who frequently buy and sell quartz crystals use a commercial cleaning liquid called Chispas which derives its cleaning effect from ammonium bi fluoride and other ingredients. It is used to clean iron stains from the quartz crystals and they credit it with also making the quartz brighter and this may be the result of the weak HF solution removing very micorcrystalline quartz from the surface of the quartz crystals. But I am not sure about this. I have seen it used in Rio Grande do Sul among the producers of amethyst specimens to make amethyst crystals bright and clean, and have been told that if the amethyst is left too long in Chispas, especially fresh Chispas, it will dull the amethyst crystals. I have seen specimens of amethyst where the amethyst crystals are still bright and shiny, but the underlying agate has been turned white on the outside and was told this was the result of even a short cleaning in Chispas. The fluorine in the solution attacked the chalcedony/agate very quickly compared to the crystallized amethyst. There are a number of commercial cleaning products that use bifluoride in their make-up; among these are those used on a regular basis in commercial car washes. Solutions of ammonium bifluoride should be neutralized by dumping marble or limestone chips into the solution. This will cause bubbling and a white precipitate of calcium fluoride (fluorite). To be sure the neutralizing reaction has been complete, keep adding marble or limestone chips till no more bubbling occurs. This may take a while.

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been complete, keep adding marble or limestone chips till no more bubbling occurs. This may take a while.

10. Possibly cleaning and or removing quartz with Hydrofluoric Acid (HF)
I am not going to tell you how to use this terrible chemical, but I will tell you some things about it that I hope may persuade you not to try to use it. I'll also tell you about some of the things it can and cannot do. The danger involved in using this acid is so great that even the experts here on Mindat recommend that you not use it. Further there is an informal policy here on Mindat, that the experts will not tell people on the bulletin board how to use this acid. There are a few uses for it that cannot be replaced with less dangerous chemicals and if you really need to use HF for those purposes, then you need to find someone who knows how to handle HF. An old chemist or chemistry teacher will do nicely; have him/her train you in how to use this reagent safely. To try and teach you about this acid by writing is not something I will willingly do. It would be inviting all kinds of trouble, especially in this litigious society.

Hydrofluoric acid is basically the poisonous gas hydrogen fluoride, dissolved in water. In its concentrated form it is a clear liquid that cannot be stored in glass because it will dissolve the container. I have been told, that in old chemistry labs it used to be store in bottles made of paraffin. This was before the advent of modern plastic containers. In small quantities it now comes in bottles made of thick plastics like polypropylene. When you open the bottle the gas will start to escape and on a humid day you can see it. It will rise up a little like steam, and let me assure you that you really do not want to breathe the stuff. So if the day is not humid, and you do not have a fume hood to get rid of the fumes from the HF, you really can't tell if you are going to breathe any of the stuff untill it is too late. A bit probably won't kill you, but if you get a whiff of it, you will run for cover. Even the most callous of us that have used this reagent many times treat this beast with respect. That is as far down that road as I am going to take you. Let me also say that many people, even those trained in chemistry have been injured short and long term by this chemical. It can do nasty things to your body. If in spite of what I have said here, you persist in trying to use HF whatever else you do, go to Wikipedia on the net and read about the acid and the attendant dangers. http://en.wikipedia.org/wiki/Hydrofluoric_acid.[Link Broken? Nov 2014] The terrible effects caused by contact with this chemical have been known for more than 100 years. Six drops will kill a dog. http://lateralscience.blogspot.co.uk/2013/06/little-dog-hydrofluoric-acid.html

All that being said, if you want to remove quartz or other silica containing minerals from around gold, silver or other minerals that are not affected by HF, then there may be no other option. In a few cases, quartz crystals may be coated with a thin druse of secondary micro quartz crystals that can possibly be dislodged by using hydrofluoric acid. To dissolve, or partially dissolve the quartz from around gold, silver, etc you need to use fairly concentrated HF and then the process will be slow, a day or two or more, depending upon on how much you want to remove. Massive quartz (bull quartz), chalcedony and opal are attacked much more quickly than the surface of regular quartz crystals. To dissolve a well-formed quartz crystal with room temperature HF can take several days, and it does not polish the quartz and make it look shiny like it will regular

glass, but rather jagged and dull. I have seen some rather drab Japan law twined quartz from Washington Camp, Arizona treated in fairly concentrated HF for several hours with the surprising result that the very fine drusy quartz that was giving a matte finish to the twins was mostly removed and the surfaces left shiny. We forgot about putting them in the acid and went back after about four hours to find this surprising result. I don't think we would have had the nerve to leave them in that long if we had remembered sooner that they were in the HF. Some of the crystals had little cracks in them, and though the HF left the surface of the quartz crystals shiny, it did attack it a bit along the edges of the cracks and it left little white trails along the cracks. My advice is that unless the quartz you are trying to clean is really exceptional, don't try and clean it with HF. It just is not worth the cost and the risk to your health. The last quote I got from a chemical company for a gallon of HF was something over $100 dollars. If you really need to use HF you can read various articles and comments on line. One of them is given here: http://www.minsocam.org/ammin/AM46/AM46_1498.pdf

Hydrogen Peroxide

Sometimes, you can use hydrogen peroxide to remove certain black manganese minerals like todorokite from quartz crystals. Some people have reported success in removing organic materials such as lichen, clay minerals ore fine grained minerals from quartz and other minerals with the use of hydrogen peroxide solutions. When the solution reacts with the manganese minerals it generates bubbles of oxygen gas. Reagent grade hydrogen peroxide can react violently with things like asphalt. Before using concentrated hydrogen peroxide be sure you really know what you are doing. We have had enough initial success in removing clay from Chinese azurite using a standard weak solution of hydrogen peroxide (hair bleach quality) that we are going to experiment more with this reagent. It is not clear just what hydrogen peroxide does in loosening impacted clay and other fine grained materials, but it has a salutatory effect. I have not had much experience using this reagent on quartz, so any help from those more knowledgeable than I will be welcomed. The results of using this reagent on manganese oxides can be very dramatic. You drop the specimen into the solution and when the bubbles clear away in a minute or two, the specimen is magically clean with all the black manganese oxide gone. I was once able in just a few minutes to clean many specimens of prehnite casts after laumontite that appeared to be hopelessly covered with black todorokite. It was like magic.

When working with chemicals like those above, you should not mix the different solutions together. This will sometimes produce unwelcome precipitates or react in ways that will be unwelcome or dangerous.

We would like to solicit Mindaters, who have had experience with cleaning quartz of different kinds, to share their experiences with various chemicals by emailing us so we can make this article more comprehensive and useful. If there is something you don't understand or want explained further, post a note on the board below and you will almost certainly be able to get further help. I have been called an expert now and then but just when I start to feel a little smug, an old friend reminds me that an ex is a has been and a spurt is a drip under pressure.

Rock Currier
Reviewed and proofread by George Holloway