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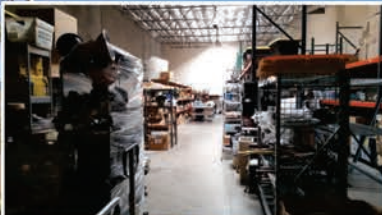


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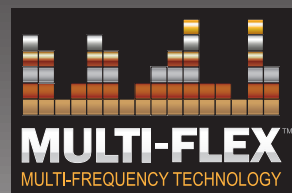
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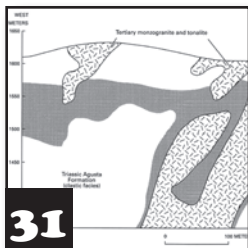
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...being sneaky, I filled in the hole, and buried therein some trash items that I had previously found, just to discourage any other detectorist that might come along.

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Fenn posted photos of what he claims is the long-hidden chest and its contents after it was found, though some believe the whole thing was a hoax because he refuses to identify the finder.



OUR COVER

Background—Drywashing an area that had previously been detected.

Inset—Gold found at an old mine.



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THE "BAWL" MILL

Crackdown on China continues

In this column last month we reported that a handful of scientists and instructors at US colleges and universities were charged after an FBI investigation revealed they were being paid by the Chinese government to pass along valuable research.

As the investigation continues, the National Institutes of Health (NIH) announced that 77 grants have been rescinded and 54 scientists have either been fired or they resigned according to *The Epoch Times*.

While the majority of violations have been against Chinese scientists based in the US, a prominent American professor from Harvard was also indicted.

Dr. Charles Lieber, the chair of Harvard's Chemistry and Chemical Biology Department, was a recognized expert in nanoscience according to a statement released by the US Department of Justice. He was indicted for failing to disclose that he was part of China's "Thousand Talents" program for which he received \$50,000 per month, \$158,000 for living expenses and \$1.5 million to establish a research lab at Wuhan University of Technology in China. The relationship reportedly began back in 2011.

According to the DOJ, China's talent recruitment plans seek to lure Chinese overseas talent and foreign experts to bring their knowledge and experience to China, and they often reward individuals for stealing proprietary information.



ASK THE EXPERTS

asktheexperts@icmj.com

Q: Unless I missed it from a previous issue, please do an article covering Ground Penetrating Radar basics as applied to lode prospecting. I see books using GPR to examine concrete structures, sinkholes, etc., but nothing for the small miner prospecting for lode gold or pocket mining.

Doug

A: From time to time, I hear rumors that someone is doing research to make ground penetrating radar (GPR) equipment that is suitable for use by the individual prospector. It is a known technology and people have looked into the possibility for years. I have been part of a research and development project for adapting GPR for finding gold in underground mines; it was not a success. I have also heard of GPR research being done for personnel land mine detection, and there are GPR devices on the market for finding land mines. Still, as of this time, there is no practical GPR device available for nugget detecting.

Radar systems make use of electromagnetic reflection, as opposed to metal detectors, which use electromagnetic induction. Ground penetrating radar (GPR) works in a manner similar to regular radar, using pulses of electromagnetic radiation that are in the microwave band of radio frequencies. The reflected signal is read and interpreted by a computer to detect subsurface structures and objects. It reads shapes, not metal,

and nuggets can be of almost any shape. Often, considerable "interpretation" of the output data is required. It's not like a metal detector that just beeps when you are over a target.

GPR works fairly well with land mines because they are good-sized and there are only a limited number of design shapes to recognize. Other uses include locating buried voids/cavities from mines, underground storage tanks, sewers, buried oil drums, buried foundations or ancient landfills. It can also be used to characterize the depth to bedrock in some placer deposits. (A firm, hard bedrock is required as opposed to a soft and weathered bedrock.)

At the present, this technology is used to identify buried metal fuel storage tanks and similar larger items like buried 55-gallon drums. Small objects are difficult to identify using GPR. A land mine would be the size of a gold nugget that weighs many pounds, so it's not really practical. So other than a possible use in bedrock testing, this technology as yet still has no real applications for the individual prospector seeking to find placer gold, but perhaps someday it might.

There are some real problems with GPR in that it does poorly in clay-rich, wet and salty ground. If GPR does become available in a version useful for detecting gold in the one-gram and larger size range, such a unit will likely cost five to ten times the price of today's most expensive detectors, and require at least two operators to operate it properly. While that may happen someday, at the present it just does not seem like

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something we are likely to see as a usable technology for finding gold.

Chris Ralph

Q: I hope all is well. Please can you give me some advice on how I can extract gold from pyrite. Your help will be appreciated.

Nardus

A: Tiny particles of gold can be formed inside the pyrite crystals found in gold deposits, and the pyrite must be destroyed to release them. Even cyanide won't get them out if they are contained inside the pyrite. Getting the gold out of pyrite usually involves destroying the pyrite either by roasting or bio-oxidation. The amount of gold in pyrite varies all over the map, and it can range from zero to large amounts of gold in the pyrite. You just never know without testing, so I would recommend an assay before you put loads of work into the effort to treat your pyrite. That way you will know for certain if your pyrite contains enough gold to be worth the effort. Once the pyrite is destroyed, it can be re-crushed and recovered by gravity methods like a

shaker table or by leaching.

Chris Ralph

Q: I have a question about this metal detector and listening for faint sounds. Does the metal detector *always* show movement in the indicator bar up top in the display, even over faint signals? I sometimes feel like I hear *real faint* sounds (iron bars might move, might not), but if I don't see the indicator bar up top moving or indicating anything, I usually just move on. Should I be digging these faint sounds with no bars that arc? Thank You!

Tahoe

A: One of the most important things in finding gold with a metal detector is to listen for those faint signals. If the sound is repeatable, you should investigate and try to find what it is. The faintest signals may not move the indicator bars on your display, so if you get a sound and then go back over it and it repeats in the same spot as before, you need to investigate. Sometimes just a simple scrape with your boot over the target spot will allow it to become much

louder, enough that it will then trigger the detector display electronics.

Chris Ralph

Q: I absolutely love prospecting; I'm keeping my metal detector and pans in the car at all times now. I was just wondering if it is usually a good sign for a detector to sound on iron and nickel in the same area of past gold mining and can this be a good indicator for possible gold?

Wayne

A: Iron-rich rocks are very common, both in old mining areas and outside of them. Sometimes iron-rich rocks are closely-associated with gold but not always, so it just depends on the geology of your area. Iron-rich rocks can be associated with gold in alluvial deposits because both are heavy and may deposit in the same areas. There are cases of gold formed around iron minerals, but because iron is the third most common element in the earth's crust, iron-rich rocks are thousands of times more common than iron-rich rocks that also contain gold.

Chris Ralph



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LEGISLATIVE AND REGULATORY UPDATE

by Scott Harn

• US Supreme Court declines to hear dredging controversy

The US Supreme Court declined to hear the latest case involving Section 402 Clean Water Act permitting in *Eastern Oregon Mining Association v. Oregon Dept. of Environmental Quality*.

The miners sued the Oregon DEQ in this case after the agency asserted that the “mere movement” of material already within a waterway constituted the addition of a pollutant under the Clean Water Act. The Oregon Supreme Court ruled in favor of DEQ and the miners appealed to the US Supreme Court.

Like several other Western States, Oregon handles Section 402 permits under a memorandum of understanding with the Environmental Protection Agency (EPA).

The matter appeared to be ripe for review as this is an ongoing permitting program that continues to ignore the intent of Congress by forcing miners to apply for a Section 402 permit when no such “addition” of a pollutant occurs. The miners were hopeful the US Supreme Court would take up the case after the court requested additional briefs be submitted. For reasons we cannot ascertain, the US Supreme Court did not include the

case in their list of cases they would be hearing this term.

However, there is still a clear path forward; see “PLP Update” on page 36 for more on this topic.

• Why Senate Bill S3422 is bad for America

“The Great America Outdoors Act” has been touted as a great piece of bipartisan legislation. It passed the US Senate by a vote of 73-25, and is expected to pass the House.

There is one item within the bill I can partially support, and that is the funding earmarked to eliminate a \$20 billion backlog of maintenance projects at national parks—the bill would direct \$9.5 billion toward that effort, though this amount would be added to the national debt.

The remainder of the bill is all bad news, and I’ll explain why below.

The bill calls for *permanent* funding for the Land, Water and Conservation Fund to the tune of *\$900 million per year*. This is funding that will be used to expand parks, refuges and other government-managed lands.

Don’t misunderstand me—I love our national parks, and I’ve visited many of them. Some of my fondest childhood memories were made during our trips in the family camper, fishing and camping throughout California, Oregon and Washington.

I especially remember when my parents saved up and splurged one year, renting a motorhome for a two-week trip when I was a teenager. We probably hit eight different national

parks during that trip, and we made stops in California, Oregon, Washington, Idaho, Montana, Wyoming, Utah and Nevada. In my adult years, I visited many of the same camping sites with my wife and family, and added some additional visits to see a few of the parks I didn’t get to see as a kid. These included Mesa Verde in Colorado, and Zion, Bryce Canyon and Arches in Utah. I even made it eastward to drive through the Great Smoky Mountains and visited historic landmarks across many of the Eastern States and the District of Columbia.

While there are benefits to public lands, there are numerous major problems with this proposed legislation that will allow additional lands to be segregated.

Access Denied

Public land management has changed significantly since I was a kid. Most of the remote locations we frequented with my parents when I was a youngster are now off limits. Historic roads have been obliterated or placed off-limits by Forest Service Travel Management Plans or the Bureau of Land Management’s Resource Management Plans. These were the best places for families with young children to camp in complete solitude and enjoy the outdoors. These historic roads are absolutely necessary for miners and prospectors to reach their prospect sites and to explore for new deposits.

There is no provision in the bill

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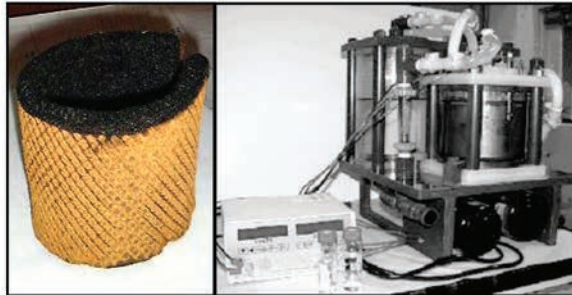
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to curtail the decommissioning of historic roads and trails when new federally-controlled lands are added, so we can expect access will become even more difficult over time unless changes are made.

field County, Utah, 93% of the land is federally-controlled with another 3.5% state-controlled.

Garfield County suffered large economic losses when President Clinton created the Grand Staircase-

School enrollment decreased by 21% from 1996-2019 and is projected to drop further.

"The Great America Outdoors Act" does not provide any limits on how much land the federal government can control in any state or county, and there is no provision for approval by state and local governments.

States with Over 25% Federal Control of Lands

State	Total Federally-controlled Acres	% of State
Alaska	222,666,580	60.9
Arizona	28,077,992	38.6
California	45,493,133	45.4
Colorado	24,100,247	36.2
Idaho	32,789,648	61.9
Nevada	56,262,610	80.1
New Mexico	24,665,774	31.7
Oregon	32,244,257	52.3
Washington	12,192,855	28.6
Wyoming	29,137,722	46.7
Utah	33,267,621	63.1

(Does not include lands administered by the Bureau of Reclamation and Dept. of Energy. Source: Congressional Research Service, "Federal Land Ownership: Overview and Data," Feb 21, 2020.)

High-Paying Jobs Lost

Second, expansion of federal control has been devastating to rural communities. Federally-administered lands account for about 640 million acres or 28% of America, with the majority in the Western States.

There are many counties in the West where the federal government controls over 70% of the land. Thirteen of Utah's 29 counties are over 70% federally-controlled, and in Gar-

Escalante monument in 1996, and even though environmental groups predicted incomes would improve after the monument was established, incomes dropped significantly when natural resource jobs were replaced with seasonal tourism jobs according to *Deseret News*. Sheep and cattle ranchers, loggers and miners were forced out after federal agencies eliminated most grazing and all logging, mining and energy development.

Mineral Potential Ignored

There's been a lot of discussion about China's near-complete control of critical minerals and the threat this imposes to America's safety and security. We currently have no substitute supply for rare earth minerals necessary for everything from solar panels and wind turbines to fighter jets and cellphones. China can cut off our supplies at a moment's notice and we have no recourse.

The proposed bill contains no provisions for testing the mineral potential of public lands before placing those lands off-limits, and this is completely unacceptable.

"The Great American Outdoors is an extremely consequential piece of legislation," said Congressman Paul Gosar (R-Arizona). "The bill combines necessary funding to address our nation's park maintenance backlog with controversial provisions to make funding for the Land and Water Conservation Fund (LWCF) permanent. I am categorically opposed to permanent funding and reauthorization of the LWCF. This would take the program completely outside of congressional oversight and commit \$900 million a



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year to be used for reckless land buying. The communities I represent in Arizona are tired of Congress giving up its responsibilities, piling up trillions in debt for future generations, and allowing the federal government to mismanage their land."

• Comment deadline extended for new California dredging regulations

California's State Water Resources Control Board extended the comment deadline to August 24.

As we mentioned last month, the

proposed suction gold dredging regulations are utterly ridiculous. The Board proposed a long list of reporting requirements (water quality, turbidity, etc.) and placed all historical gold mining areas of California off-limits due to the possible interference with endangered or threatened species and the possibility that mercury may be present. And a permit would cost you in excess of \$2,500 to dredge where no gold is present.

A link to the proposed regulations is provided with the online version of

this article.

Comment letters must be received no later than 12:00 p.m. (noon) on August 24, 2020. Written comment letters must be addressed to:

Jeanine Townsend, Clerk to the Board
State Water Res. Control Board
P.O. Box 100
Sacramento, CA 95812-2000

As mentioned previously, there is still a clear path forward, and you can find out more in the "PLP Update" on page 36.



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HARD ROCK 101: MICRO BLASTING

by John Norman

In our first two articles, we covered the basics of rock drilling and mechanical breaking. This month, we are going to introduce a new topic: explosives.

Specifically, we are covering small-scale techniques that can be used by a one- or two-man operation without the need for permits or licenses in most cases. These “micro blasting systems” are sold as a combination of tooling and propellant cartridges that, used together, can break up to a half cubic yard or more of very hard rock in one blast.

We will cover two commercially-available systems—the EZ Break and the Sierra Blaster. There is also a third system called the Boulder Buster on the market. It is a more specialized industry tool that requires the use of a large pneumatic drill, so we won't discuss it here.

(Note: “Micro-Blaster” is a registered trademark of Ezebreak, LLC. In this article, we will be using the term “micro blasting” to mean small-scale blasting generically, and not a specific vendor’s system.)

When is This Method a Good Fit?

Micro blasting can be an excellent technique for the small miner. The tools are lightweight and can be packed in. It can be used as a way of getting at placer deposits that were previously untouched due to rock cover. Micro blasting can be used to take down hanging rock, separate minerals from overburden, and collect gemstones and other high-value product with minimal damage.

This technique excels at breaking up free-standing boulders that are too heavy to move by other means. It can be used as a secondary process when expanding grout, heavy equipment or larger explosives generate big rock fragments. It is also used by cave rescue teams to remove obstacles and expand tight passages.

One other advantage to owning a micro blaster is that it offers a way to gain experience in blasting that can be used towards eventually becoming a licensed blaster. States such as California have requirements such as “three years documented experience

with electric or non-electric blasting.” The two systems we discuss below have been used successfully in building that book of experience.

Safety

All types of blasting can generate

dangerous fly rock. While this is minimized in micro blasting, sharp fragments of rock and flying tools can cause injury. All rock that is above ground level contains stored energy from gravity and can crush or kill when suddenly released by a blast.

This type of blasting cartridge is not able to explode if ignited unconfined, but electrical currents, lightning and sparks can cause them to detonate and cause injury during the



This is a size comparison of 500 g emulsion stick (normal blasting) vs. Sierra Blaster cartridges used in micro blasting.



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loading process if care is not taken. No explosives should ever be handled if a lightning storm is approaching, and your head and other body parts should be never be positioned over a hole during the loading operation. If cartridges must be pushed into a hole, a wooden dowel should be used. Personal protective equipment for this activity includes safety glasses, gloves and steel-toed boots. Fly rock can be controlled with simple canvas tarps or pieces of used conveyor belt.

Legal Status

In the US, all explosives are regulated federally by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). Buying and using ex-

plosives generally requires a Federal Explosives License (FEL). The ATF has a number of exceptions, such as smokeless powder used for reloading ammunition and up to 50 lbs/year of black powder for "sporting and cultural purposes." Note that blasting is *not* one of the exempt purposes, so you technically need an FEL and an approved magazine to use and store gunpowder for blasting rock, even though it can be legally purchased for other uses.

The makers of the systems we will be discussing have obtained a specific ATF exemption for their respective products. The cartridges are classified as "Articles Pyrotechnic" (a type of "professional use only" product)

and the manufacturers are allowed to sell them to a non-licensee. In order to purchase the cartridges for either system, the manufacturer's training must be completed online.

In some jurisdictions, such as Massachusetts, you may still be required to obtain a state blaster's license in order to use these systems. And while they can be plausibly referred to as a "powder-actuated tool," some BLM or USFS offices might ask for a "Notice of Intent" or a "Plan of Operation" if you are micro blasting. I believe the intent of the regulations is to cover only operators that could leave behind large-scale surface disturbances or HAZMAT such as abandoned dynamite, but your local office may feel differently.



Holes drilled for micro blasting must be cleaned out before any explosives are loaded. This is an air blower used to clean the hole.

Blasting Basics

Most mining done with explosives involves this basic process:

1. Holes are laid out and drilled to the proper depth (see Part 1, May 2020 issue, for information on rock drilling).
2. Rock dust and chips are cleaned out as necessary.
3. An explosive charge is placed at the bottom of the hole.
4. The rest of the hole is filled with stemming such as sand or gravel to contain the energy of the charge.
5. The charge is detonated, causing a shock wave, followed up quickly by expanding gases that first crack and then heave out the rock burden.

In micro blasting, we are doing the same thing, with a few small differences:

1. The holes are much smaller (typically 5/16" or 10mm vs. 1.5-4").
2. The charges in each hole are smaller (1-5 grams vs. 50-5000+ grams)
3. The explosive material is typically a propellant, which deflagrates (more on this later) and breaks the rock primarily through over-pressure.
4. Instead of sand or other bulk stemming material, micro blasting uses a special tool that seals up the hole and provide the means to initiate the charge.

What Goes on Inside a Blast Hole

To understand how this works, we should take a quick look at what is going on when we blast. With con-

ventional mining explosives, there are three parts to the charge we place down a hole:

1. An electric or non-electric blasting cap that explodes on command, shooting a high-energy shock wave into the booster. This is typically inserted into the booster and placed at the very bottom of the hole.

2. A high explosive booster charge that is "cap-sensitive" and detonates from the blasting cap. Cast boosters and dynamite are typical products used for this.

3. A quantity of bulk blasting agent such as ANFO. This material is not very sensitive and needs the booster to set it off. Smaller blasts may omit this component, relying on a larger, single charge of dynamite or emulsion product.

It's important to note that the explosives used in conventional mining will explode whether or not they are confined inside of a borehole. Setting them off in a pile on the ground will result in a very large air blast, a lot of noise, and dirt/rock being violently thrown.

By contrast, the material used in micro blasting is classified as a "propellant." Typical ingredients are nitrocellulose and similar compounds used in rifle and pistol ammunition. It is set off by a shotgun primer or an electric "hot wire" igniter. Approximately one liter of gas is generated per gram of material used. If materials are ignited outside of a borehole, the cartridge will pop open and the powder will burn with similar intensity to a firework.

If the cartridge is ignited at the bottom of a well-stemmed hole, however, something different happens. As the material burns, pressure and temperature begin to rise quickly. This causes the burning or "deflagration" to proceed faster, generating more heat and more pressure, in a "synergistic" type of reaction that becomes so violent that it is almost indistinguishable from that of a high explosive.

As the pressure inside the hole climbs into the 100's of thousands of pounds per square inch (PSI), the rock begins to come apart at its weak points and split into big fragments. Once this happens, the pressure drops and the reaction fizzles out, with any unburned powder simply burning off. Once key point with micro blasting is

that the harder the rock is, the better it works. While conventional explosives will work just fine in rotten rock or even gravel, micro blasting requires sound rock that can contain the expanding gases long enough for pressure to build up.

Rock Dynamics

With conventional or micro blasting, the rock expands and moves in the direction of least resistance. The more "free faces" or areas for the broken rock to expand into, the more

work can be done per blast. The results of a single-hole blast can be anything from a "spider web" of cracks to a 2-foot cube of rock being shattered into fragments that one person can easily pick up. Free-standing boulders are all free faces and break very easily. It is realistic to break up and remove a car-sized rock with these tools and a few hours of work.

At the other extreme, a solid wall of granite is much more challenging to blast. The micro blasting heads either need to be placed in a way that



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Both the Sierra Blaster and EZ Break require a weight to hold in the explosion while the gasses expand. This shows a Sierra Blaster two-hole blast with two heads on top of the cartridges.



This is a photo taken after a successful micro blast, showing a fully shattered boulder broken into large pieces. The worst case in this type of blasting yields just a piece or two blown out or it just cracks in place.

ejects a “wedge” of material, or large holes need to be drilled nearby to provide relief for the rock to move into.

A “dice” pattern of 4 holes in a square is one way to break a very large boulder into pieces, while a “V” pattern with angled holes can be used to create the wedge cut described above. A line of holes can be drilled and fired to slice a section off a boulder or rock outcrop. For long sections, every other hole can be empty and simply placed to help the rock crack in a line.

Getting Hands-On

Both blasting systems are sold as a kit containing one or more firing heads, a selection of drill bits, tools for cleaning out the bore holes, and a means of firing the charges. With both the EZ Break and Sierra Blaster, multiple blast holes can be set up and fired simultaneously.

A kit with all necessary materials for single-hole blasting weighs around 10 pounds for either system. They are available mail-order from several dealers, and the blasting cartridges can be shipped directly to your door, although there is a HAZMAT charge.

Either type will work with a cordless, lightweight, 110V SDS+ hammer drill, and the energy source for firing can be portable. In testing, we found that either system will break rock similarly, but there are key differences such as water-resistance and support equipment needs.

EZ Break. The EZ Break Micro-Blaster uses a single type of powder cartridge, a red paper cylinder with a #209 shotgun primer on one end and approximately one gram of fast, double-base smokeless gunpowder inside.

The firing head consists of a heavy, machined, steel cylinder fitted to a long steel rod that gets placed in the hole. Inside the head is a pneumatic plunger that sends a long firing pin into the cartridge below it when triggered with a blast of compressed air. The firing pin and other parts are user-serviceable. The head is well-made and comes with a nice oxide finish. According to the manufacturer, basic care includes cleaning and light oiling, similar to a firearm.

The kit contains a tough pneumatic hose and a CO₂-powered “inflator” device that will initiate one

head without any external air source. A connector and air fittings are also available to allow 3 or more heads to be fired from the compressed air source of your choice. Also in the kit is a brush and a nice air-blower bulb for cleaning rock dust from the holes.

The drills sold for this application are 5/16" in diameter and available in lengths up to 18" long. With a clean, straight, 18" hole, up to (4) EZ Break cartridges can be loaded in one hole. We found that it takes some practice

in order to drill a straight hole this deep, as small diameter drills are not very rigid. Best results are obtained by starting with a short "stub drill" and changing bits in 2-4" increments as the hole progresses. Frequent cleaning of rock dust is also a good idea.

Once the hole is drilled and cleaned to the extent possible, one or more cartridges are dropped into the hole. It's best to insert them one at a time and use a wooden stick to press each one

into place. Placing them all at once may result in a jam-up. Cartridges are loaded primer-up and should be placed as far into the hole as possible and touching one another.

Next, the firing head is made ready. The operator double-checks that the air source has been disconnected and resets the firing pin between shots by pushing it all the way inside using a small piece of wire. A magnet inside holds everything in place until firing.

The firing head is carefully in-



This shows all the items in a Sierra Blaster three-hole kit, including heads, connector cables and drills.



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serted down the hole until it is in close contact with the top cartridge. A light twisting motion can ensure it is fully seated. At least 6" of the rod should be embedded in the rock to ensure proper containment of the blast energy.

When the firing head is ready, the operator retreats back to a safe area, attaches the air source and triggers the firing pin with compressed air. There is no specific limit to the number of heads that may be fired simultaneously, but most operators seem to use from one to three. A larger air source such as an air tank or bulk CO₂ bottle is necessary if using more than one head, and the plumbing does need to be tested for leaks before use.

Sierra Blaster. The Sierra Blaster works similarly to the EZ break Micro-Blaster, but has key differences. First, the system uses electricity instead of compressed air for firing, so the blasting heads have no moving parts. Secondly, the whole system is designed to be water-resistant, so it can be used for tasks such as breaking



A standard blast trigger device like this one can be used to set off the Sierra Blaster; the EZ Break unit uses a CO₂ inflator to trigger.

up rock in a moving creek, and water can be added to holes for better energy transmission. Third, the Sierra Blaster heads come with a "leash" system that allows the heads to be tethered to a hanger screwed into the rock. This helps prevent damage to the head or wiring, especially when blasting into a vertical face.

There are two types of cartridges sold with the Sierra Blaster—electric main cartridges and "booster" cartridges that contain only powder and no igniter. Up to two of these can be dropped down a hole, in addition to the main charge. According to the maker, each cartridge contains 1 gram (+/- 5%) of a smokeless gunpowder product. As with the EZ-Break, the rod must be solidly embedded into the rock. According to the directions, the leash system should always be used to prevent the head from being damaged. It can be attached to a nearby boulder or clipped to the rock using the supplied drill bit, concrete screw and hanger.

The Sierra Blaster utilizes a 10mm hole diameter, which is about 25% larger than the EZ-Break. These drills can be hard to find in hardware stores, but Sierra Blaster sells a line of drill bits up to 24" long under the name "Sierra Tuff." The bits are good quality, and are available in two types for various rock conditions.

The hole-cleaning device supplied is a modified air pump, which pushes more air down the hole than a bulb type blower. Various cables, firing line and electrical accessories are supplied with the kit for hooking up a single- or multiple-head shot.

This takes us to one potential disadvantage—the need for electrical power. The recommended firing system is a 110V generator. This is not a problem for a surface mining operation, but is not practical for underground use. We tested a variety of firing methods, and found that the following would work:

- A 400W pure sine-wave inverter unit from Samlex installed in our truck successfully fired 4 heads.
 - A 1-joule pocket-sized blasting machine used for firing explosives reliably fired one head.
 - The cheap, imported, 800W 2-cycle generators sold under various names will fire a 4 head shot.
- The Sierra Blaster heads can be purchased in either lightweight alu-

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minum or heavier stainless-steel models. The manufacturer recommends placing rocks or sandbags over either type to improve performance, and states that it's required for the aluminum type.

The wiring connections and electrical parts are probably the only weak point of this system. It is possible to kink or break the somewhat delicate wires from the electric cartridge, and the electrical cables and connectors, while heavy-duty, can be damaged by rockfall.

Conclusion

Micro blasting is a very useful tool for man-portable, small-scale blasting. The two systems available both do the job. The amount of explosive material used in each one is basically the same due to ATF regulations, and performance on free-standing rock appears to be similar.

Blasting cartridges for either retail for \$1-2.50/each, and the tooling costs are roughly similar, depending on the options purchased. If there is a dealer in your area, you might consider them first, as buying the cartridges in person saves the \$40 HAZMAT fee UPS charges.

Happy mining!

Sources

Aaron Klemenok, President, Sierra Blaster, LLC.

Carroll Bassett, BMS Rescue Equipment

Charles Harrod, Blasters Tool & Supply Co., Inc.

Paul Stovall, SBS Cave & Technical Rescue Team

Paul Spickler, Sierra Blaster Dealer

Sierra Blaster On-line Certification: <https://www.sierrablaster.com/cartridge-certification/>

EZ Break Micro-Blaster Training Videos: <https://www.ezebreak.com/videos/>

John been involved in prospecting, rock hounding and amateur mining for 20+ years and is a licensed blaster. He currently serves on a Search & Rescue team that covers abandoned mines and other underground rescue in San Bernardino County, CA. He welcomes questions via email: jnorman@accxproducts.com



SLUICING AND DETECTING DOWNSTREAM

by Matteo Oberto

During the 2019 gold prospecting season, I became part of a bigger detecting team, composed of myself and three good friends. Luca is my best friend and he is very knowledgeable about how to use metal detectors. Giacomo sells army surplus items at his shop in Turin, in northwest Italy. Lorenzo is an amateur and is curious to know all about gold prospecting.

As a geologist specializing in gold and gem prospecting, I try to share my geology and mining knowledge with the team. Mainly, I look for undiscovered gold-bearing alpine veins and gold-rich placers in Italy. We formed this group about a year ago. I explained to them how to look for gold flakes and nuggets using crevicing and panning techniques, and how to set up a sluicing operation properly in order to get the best yield. Above

all, we search for gold-rich resources, where a small-scale mining operation could be started.

During our recent prospecting trips, Luca was our detecting instructor. He learned how to use detectors and accessories in Australia years ago thanks to his several journeys in Victoria looking for gold nuggets. Then, he had to move to Italy due to his job, and the "gold fever" followed him. Over the years, he realized that the Italian country is not just rich in touristic attractions, but also in gold nuggets. We purchased several detectors—both VLF (very low frequency) and PI (pulse induction) machines—and then we started looking for gold nuggets in the alpine rivers of Italy.

We soon realized this way of detecting is not so easy. In fact, most Italian watercourses are heavily pol-

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luted with iron materials and lead shot. Fortunately, I found a few good spots rich with crevices, some previously worked, and we began our search for gold. As soon as we started, our first results were promising. I found my first nugget more or less one year ago, when I was out with Luca. It was the first detecting session and I recovered three really nice gold nuggets weighing about 0.3 grams each. Then, early last fall, I found my first gold-rich

patch along a few crevices in the same river and found five grams of gold nuggets in one outing! This is an amazing result for the Italian rivers.

The 2020 season started very well in February when I found a new gold-bearing river. My first impression was great, and so I called the river "Rio Oberto." In Italy, you should be aware that "claim jumpers" are widespread and like "bees on honey." They can overcrowd your spot for weeks if they find it and there are no rights for amateurs. Secrecy is always a good and necessary thing.

Gold showed up in the first pans with nuggets, granules

and more rarely flakes, found along the crevices but also in the river sediments themselves, sitting on the bedrock. My initial thought was very clear; all this gold had likely come from the erosional slopes, outcropping about 10 meters upstream, which contained several big, well-rounded boulders that still showed traces of hydrothermal veins inside. I sampled this reddish, altered sediment, looking for gold, and I found from 5 up to 10 coarse and thick gold granules in every pan.

I was excited, so at the end of February 2020, I set up my sluice and I processed 20 buckets of sediments (200 liters in total of sediment classified with a 1 centimeter sieve). I got about 1.3 grams in total—it wasn't much, but I was surprised to see more granules than flakes. In Italy, you usually have to be satisfied with thin flakes, not coarse gold. In my opinion, the gold concentration in the sediment forming the slope was quite good at 0.07 gram per bucket.

The erosion of these auriferous sediments is probably the reason why we found the gold a few meters downstream, trapped in the first crevices available. I also checked the slopes upstream and the gold was not present in that high of a concentration.

The author sitting on a boulder composed of hydrothermal quartz carbonate and showing thin sulphide-rich veins. This should be the most probable origin of the gold in this river, but where is the main outcrop upstream? The research is ongoing.

(Photo by Ricca C.)



My detecting and gold prospecting partners from left to right: Luca, Lorenzo and Giacomo. (Photo by the author.)

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(Every pan yielded about 2-3 colors, but it was not enough to become the focus of our attention.) About 40 meters downstream the gold started disappearing. I concluded those slopes

should have been the dispersion point in our case.

After panning and sluicing, we switched our focus to detecting. We started checking our already ex-

ploited crevices, searching for lost gold nuggets, and we recovered about half a gram. Remember to always recheck your crevices if you own a metal detector—you never know what you can still find there.

Then the coronavirus lockdown happened and we waited two months, asking each other, “How much is that slope still hiding from us?”

The day after the end of the Italian lockdown, we went prospecting upstream to that “magic slope.” Obviously, we hoped that nobody found it during the quarantine.

A little miracle happened here: Giacomo found his first gold nugget within the first 10 minutes of the day! It is quite difficult to explain the emotion you feel when you find the first nugget in your life—I think most readers could never forget their first nugget. I saw the excitement in his eyes, his enthusiasm and also the famous “gold fever.” So, the “magic slope” also contains little gold nuggets.



This slope shows the two different alluvial deposits. The lowest one is the most altered and contains gold granules and little nuggets. The above recent alluvium is void of gold. (Photo by the author.) Inset: Gold recovered from the slope.

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Giacomo's first gold nugget. (Photo by the author.)

I think during the next few months, our team is going to focus more on the area about 30 meters downstream on the slope.

See you at the next adventure!

The author is an Italian gold prospector and exploration geologist, a passionate researcher and consultant. Lately, he goes to the river in order to prospect for gold, gems and economical minerals with friends, students and mineral companies. Follow his adventures on his YouTube channel: Matteo Oberto Prospector. He welcomes questions or comments via email at matteo.oberto183@gmail.com



Tips and Tricks by Harry F. Griffin

When I wrote the "Tips & Tricks" Dirt Dauber article (May 2020 *ICMJ*, pgs 15-16) and asked for suggestions as how to best secure the rubber cap to the dredge powerpack, I had no idea as to the number of great ideas and suggestions I would receive.

Many, many thanks to all the folks that contacted me.

Many suggestions had some pieces or parts that would work some of the time, but Dredger Dan's suggestion was, in my humble opinion, the cleanest, cleverest, and most dependable. However, because I did not have some of the items in my shop that he utilized, I changed his recipe ever-so-slightly in order to achieve the same end result: securing the anti-Dirt

Dauber cap onto the powerpack, and more specifically onto the compressor itself. What follows is what I did to accomplish this task.

Surrounding the rubber cap are the tools used to permanently attach a line to the cup, and then the cup to the compressor: high-visibility, yellow, microfilament, braided 20-lb. fishing line, a very large sewing needle, and some very small rivet eyelets. (Dan used a small bead here, but I think that any very small object would be suitable for this task. You could also begin tying the line into knots until you have a sufficiently large knot-ball.)

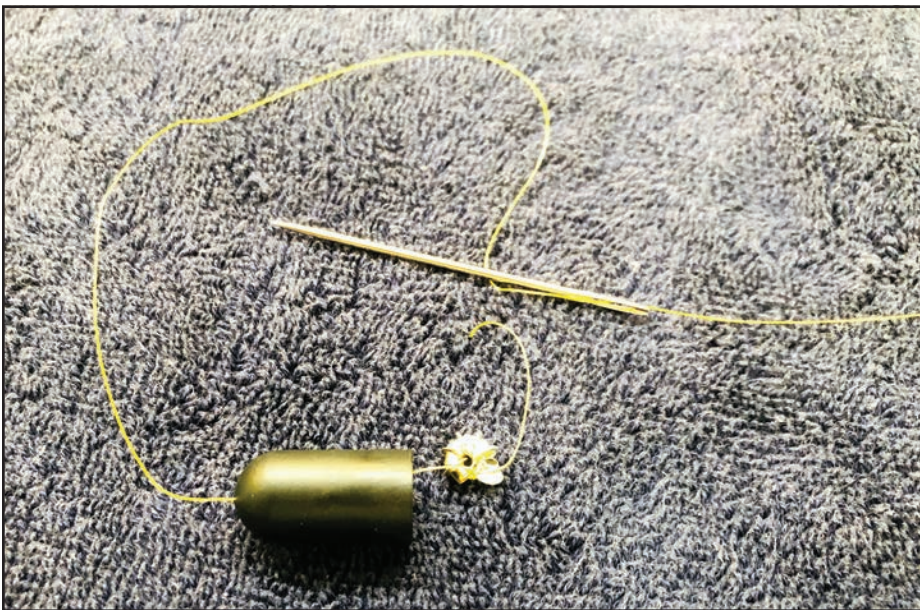
I needed to create a stopper, so I threaded several rivet eyelets onto the line and securely tied them off with a square knot.

I then cut about three feet of line from the spool and threaded the large needle.

Beginning from inside the cup, I pushed the needle through the rubber cap. Once the needle was through the cap, I pulled the stopper-ball of eyelets into the cup, seating them at the tip the cup.



The tools needed to permanently attach the line to the cup and the cup to the compressor.



Dredger Dan's solution used a fishing line that had been threaded through the cup with a large sewing needle. A small bead (the author used a small rivet eyelet) wrapped in the fishing line created a stopper.



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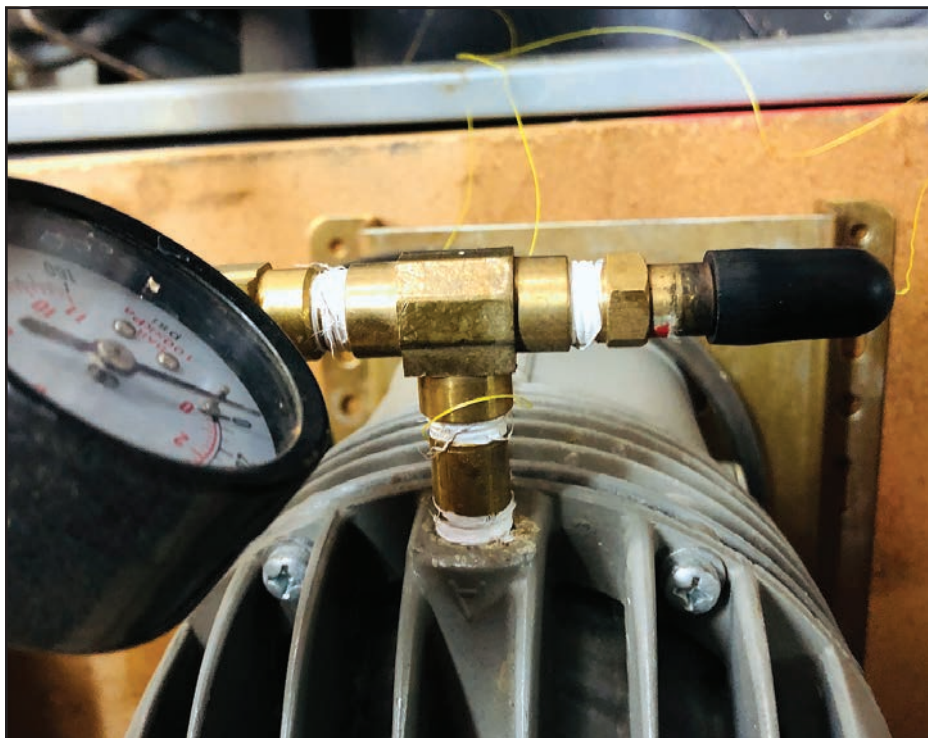

Attaching the other end of the fishing line to the compressor completed the task.

Wishing for all a safe and productive 2020 dredging season!

The author is a retired academic and military guy, and an avid

dredger and outdoorsman. He can be reached via email at harry.f.griffin@gmail.com

If you have something for our "Tips and Tricks" section, please give us a call or email us at: info@icmj.com



The author's finished project. The cap keeps the pesky daubers out and the fishing line connects the cap permanently to the compressor. Problem solved!

GOLD PROSPECTING:

For Better or Worse



Drawing by William Chmiel, age 9

Does Caliche Grow?

by Bob Schall

Since I hunt gold almost exclusively in the desert, I have become very familiar with a substance called caliche. It is a calcium carbonate "glue" that locks sand, gravel, etc., into a type of natural cement.

I don't believe I ever heard of this material until I came out to Quartzsite, Arizona. Quartzsite is where thousands of "snowbird" folks end up each year while dodging the cold weather up north. I decided to park my camper and join them.

Then, I noticed that hundreds of them were either drywashing (whatever *that* is) or walking around the desert with metal detectors... They were looking for gold!

That sounded like a great idea to me, so I "buddied up" with some guys and helped them "dry wash." That's when I was told to dig down to the "caliche" because that's where the gold usually lays on this "false bedrock."

I spent a number of days helping dig down to this layer, and running the dirt through their drywashers. Finding gold this way is exciting when you finally have a clean-up and you see that beautiful yellow color in the pan! However, after a few days, I decided this is an awful lot of work for an out-of-shape Midwesterner.

I had tried to dig into the caliche layer itself in a few places to see if all the gold really was on top of it. Wow, *that* is work; and it also didn't seem to pay off with any gold.

This all helped me decide that there had to be an easier way to get gold, so I got acquainted with some of the metal detectorists wandering the area. Yeah, that looked *a lot* easier.

So, I bought a VLF (very low fre-

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quency) metal detector. After 17 days of looking and finding nothing but endless piles of trash, I wasn't so sure about the "easier" part. Then, on the 18th day, I scanned the end wall of a trench that previous drywashing guys had given up on. I got a signal, and dug it out from about two inches deep. Wow! My first beautiful gold nugget! The drywasher guys had evidently quit digging just a tiny bit too soon.

Soon after this, the nuggets started coming pretty regularly. Why does this happen? Somehow your brain (or the fates) just don't really believe you can find gold this way until it actually happens. I still can't explain it because I was digging every signal I heard, which previously had only produced a lot of trash.

At any rate, I noticed that a lot of the nuggets *did* seem to lie on top of this caliche layer. Then, through the years, I ran into quite a few nuggets that were a few inches into the caliche! This made me wonder, "How could they get down into this desert cement?"

They can also be danged hard to dig out! Could there be nuggets *below* this caliche layer that I couldn't hear with a metal detector? Well, I finally had one event that definitely seemed to answer these questions for me.

One day I was detecting along the sides of a large dry wash that had been previously worked for gold by a big company. They had used large, front-end loaders to scoop sideways across this wash. They then took this loose dirt/gravel to their processing plant. This left a wide wash with loose dirt along the outside edges where it had fallen off the scoops as they lifted up the loader bucket. It must have been a great gold-producing wash because *wow*, did I ever find some nice big nuggets in this "leftover" dirt! One weighed in at 1.25 troy ounce!

I then decided to detect the bottom center of this dry wash as some dirt had washed down into that area. After quite a while, I got a really good signal almost right in the center of this previously-worked area.

I got my small hand pick off my belt and started digging. After removing about four inches of gravel, I hit hard, solid caliche. Now the detector signal was even louder!!!

I should mention that an acquaintance of mine had recently found an *eight-troy-ounce* nugget in the same

area. He showed me pictures of it, but wouldn't tell me exactly where he had found it.

I knew, however, that he had been working an area near this spot. I had visions of the great-granddaddy of his nugget coming out of my dig! What else could it be? It was somewhere down in solid caliche. (God must have put it in there!)

I chipped down into the caliche with my short pick until I got so deep that I was raking and bloodying my knuckles on the top of the dig. The signal just got bigger and bigger. At *least* 8 ounces, I surmised (and grinned with hope in spite of my bleeding knuckles).

I finally thought, "This ain't working," and so I decided to go and borrow my friend Tex's big, full-sized prospecting pick.

Of course, being sneaky, I filled in the hole, and buried therein some trash items that I had previously found, just to discourage any other detectorist that might come along. After all, I wanted to protect my 8-ounce-plus nugget while I went to borrow the big pick. (I know none of you other detectorists would be that devious, right?)

On returning, I dug out the junk from the previous hole, and began hitting it with the *big* pick! Almost immediately, I broke through the bottom of the caliche layer. I started digging out gravel once again. How

could this be? The target was under a caliche layer! I went back to work and dug deeper into the loose stuff. *Bam*, I hit the target!

With visions of a fully-paid vacation trip to Hawaii—and a *giant* grin—I carefully worked to dig out the big target!


It was a mashed aluminum beer can!!!

Would you believe I was slightly disappointed? Well, maybe more like *massively* disappointed. How in the world could a can be *below* a layer of caliche?

This event, however, seemed to reinforce my previous assumption that caliche actually grows with time. I guess this beer can must have been dropped after they had scooped out the wash, then a layer of washed-in gravel had covered it. Then, a limey deposit was washed over that, and the desert heat and drying had formed this layer of "cement" above the gravel. Then later, floods must have deposited more gravel on top of that.

Having found nuggets an inch or two into caliche, I had surmised that caliche actually grew upward, but I wasn't absolutely sure, as perhaps the gold could have sunk down into it in some way.

Now this seemed to be proof that caliche definitely could, and *did* grow. Also, since it was an aluminum can, and the big front-end loaders scooped




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this out in the early '60's, it must mean that caliche could grow fast.

Whereas I thought it might take thousands of years for significant growth, here was a layer that apparently grew in just a few decades!

When returning the large pick to Ole Tex, I tried to explain my theory of caliche growth to him. Unfortunately, all I did was stir up the "Texas" in him.

"Whoa up!" he said. "We Texans know all about this! Down in Texas we have some washes that have this 'speedy' caliche. Cowboys have learned that they have to keep their horses at a full gallop when riding down these

washes after a rain. I guess one time we forgot to tell a 'newly-hired' cowboy, who had previously worked on a horse ranch in Montana. After a light rain, he was riding down a wash and stopped to light a cigarette. Pretty quickly, the speedy caliche froze the horse's hooves to the ground and started climbing up his legs.

"Unfortunately, before any help could arrive, the caliche had covered both the horse and rider with a half-inch layer of caliche, and it had dried solid. To keep things from being a total loss, they chipped the horse's hooves loose and moved the whole shebang down to the front of

the courthouse. Saved the county big money over buying a statue!"

Hey folks: I included that story only for it's entertainment value. I'm suspicious that Tex may have been "stretching the truth" *just a tiny bit!* I think "speedy caliche" may be more *baloney* than caliche.

Anyhow, I believe we should probably disregard Tex's "speedy caliche" story for the rest of this discussion.

Seriously though, where do you drywashing guys stand on caliche? (pun, pun, pun.) I have definitely had to chip a few nuggets out of this "cement." Two of them were after dry-washer guys had cleaned and scraped the area.

Okay, so... what should you do? I would suggest following up your work with a VLF detector with a small coil. This rig can find shallow gold so small you can hardly see it. On the other hand, if you were not in the right kind of caliche, you would be wasting your time.

As an aside, you should *always* check your coarse rock piles and fine rock piles with a metal detector after drywashing. We used to find a lot of nice nuggets in the old leavings that somehow escaped the drywasher. This includes one that was over a troy ounce in a coarse rock pile found by my friend, Ole Tex. This story, however, is *not* baloney...I weighed the actual nugget!

Going back to metal detecting, however, I wonder how many nuggets we actually miss because they are buried down deep under a false caliche layer? Short of digging a six- or ten-foot hole under every nugget we find (and I'll let *you* do that!), I guess we will never know.

Talk to your detecting friends, and see if they have had any similar unusual experiences with caliche. We need to build a general consensus on how to handle this stuff more effectively.

Oh, I almost forgot: Tex insisted that I warn you all that, in case it rains, please, please, please watch out for "speedy caliche"!

As for me, when I'm around a gaggle of gold prospectors, I'm much more afraid of running into a bunch of baloney than I am into a bunch of "speedy caliche"!

Good Hunting to all!
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10 KEYS TO PROSPECTING LIKE A PRO

by Chris Ralph

Want to find a lot more gold when you get out there to prospect? Well I've put together ten ideas that I think will help you become more successful, and get you out there prospecting like a pro. I'll dive into each one and tell you how to do it and make these techniques bring you prospecting success.

It seems that far too many prospectors, (and sometimes me, too) will head out to those same spots where we have found gold in previous years, even if that means we will continue to just find only a little bit of gold in those same old spots. That is the common prospector's rut, chasing after those last crumbs. Successful prospecting is an ongoing quest to find rich spots with good gold—a real search—and that is one of the true secrets of success. Let's take a look at my ten keys to prospecting like a pro:

Research Pays Dividends

Research is like homework from school, and no one really wants to do that, so a lot of prospectors put it off and don't do much serious research to find new locations, yet there is no question that research pays off. There are many ways to do this, but two of my favorites are old mining district reports and mining history books. Most Western states have some form of government mining and geology bureau, and they all seem to have different names in each state. Depending on the type of mines found there, the reports might cover not just gold but also silver, gemstones and a variety of other mineral products.

I also find that old history books for the area are very helpful. Many of these books were written by people

with personal ties to the area they are writing about. As a result, the books often include some valuable information about old mining discoveries that just can't be found by any other means. Whenever I see these types of books for sale, I try to get a copy for my collection. Sometimes these history books will also contain information from old newspapers of the day. Newspaper articles often covered things that didn't make it into the official government reports.

In my research I recently came across a historic interview of an old time miner who was recalling the mining history of an area he worked as a younger man. I knew that a little bit of placer mining had been done in the area he was talking about, but the official reports just mentioned that some placer gold was recovered and did not give any information as to where the placer deposits were located. The district was a large one, and finding the placer part of it would have been like hunting down a needle in a very large haystack, so I never took the time to go looking for it. However, the old timer knew about that placer mining and mentioned some basic details about the location in an

old interview. The clues he provided plus the geology I viewed on maps from the area helped me find this little-known placer area, and I could see as soon as I arrived that no one had worked it for decades.

Learn the Basics About Geology

Reading and learning about gold geology is another thing that feels so much like a homework assignment that many prospectors want to skip it. You don't need to be a geology expert, but some basic understanding can be really helpful.

Every mining district or region where you might be prospecting has a productive geology that is favorable for that district, and changes from place to place. Most old mining reports will state what that favorable rock type, contact or fault zone is for the deposits in that mining district. Once you have discovered what the favorable type is in that area, then you can find other places with similar geology nearby. These places may prove productive. I know a number of guys who have been very successful finding little-known spots on the outskirts of better-known locations using this type of technique. Understanding and being able to recognize the favorable rock types that produce gold deposits is work but it also leads prospectors to success. Knowing the best places to focus your prospecting efforts is critical.

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Think Outside the Box

When prospectors get in a rut, they are often using their same old methods of finding and recovering gold. Sometimes success means tossing out a lot of your old assumptions, starting fresh and thinking outside the box. Sometimes this means exploring new locations, and sometimes this means working old locations with some new or different technology.

Several years ago, I took a new metal detector to a spot that had produced only a small amount of gold with previous detectors. This was a more sensitive detector, and I started trying out some old spots. Within ten minutes of arriving I found a nugget, and another five minutes later I'd found a second one. I think I went home with a total of around 20 nuggets that day, all because I'd used a different metal detector.

Sometimes it's switching methods completely. I've taken detectors to places I had only drywashed before, and drywashers to places I had only previously metal detected. A new level of success came with the change in method. Sometimes a change as small as a different type of equipment can make a big difference in the amount of gold you take home.

Persistence

Another big secret of prospecting success is to never be fully satisfied with the amount of gold you are finding. Unless you hit it really big, you should continue the quest and try to find more.

Yet the amount of work required to get out and explore to find new areas makes it difficult. You know in your mind that not every trip out to a new area is going to be successful and yield a lot of gold. When exploring, you will experience more failures than successes.

Sometimes, with high hopes, you get out to that new spot, and soon determine that it's just not what you expected. Many prospectors are put off by the amount of work that can be involved in finding and exploring a series of new places. The frequent failures can be discouraging. Yet, in the end you will learn a lot and gain experience through your explorations, and when you do find a good new spot that is productive, it will be well worth your time and all the more rewarding because of all the work you put in to find it. Remember that ex-

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ploration is something all the more successful prospectors get out to do on a regular basis.

Consider Hard Rock *and* Placer

Most new prospectors start with a focus on placer deposits, and this makes sense because placers are easier to work and get some gold. But as you gain experience, you should start to think about hard rock sources for several reasons.

One goal that prospectors can work towards is finding the source of the placers they are working. Not all placer deposits are suited to yield a productive search for their source; some placers are the result of hundreds of different small sources that are combined to produce the placer gold that has been found. Working to find a multitude of small sources is very difficult. The sources best-suited to exploration are those where there is only just one or perhaps only a few main sources for the placer gold. Gold that is rough and coarse hasn't travelled far from its original source. Sometimes that source is a hard rock deposit that may have a rich, residual

placer still sitting in place at the outcrop of the hard rock vein system.

The dumps around hard rock mines can be an interesting spot for the prospector, and are often overlooked as a source for gold. I recently crushed up a

pound of hard rock ore I got off a mine dump with my detector and ended up with almost half an ounce of gold. Still, not all old hard rock gold mines are well-suited for prospecting, as most hard rock gold is tiny. However, some

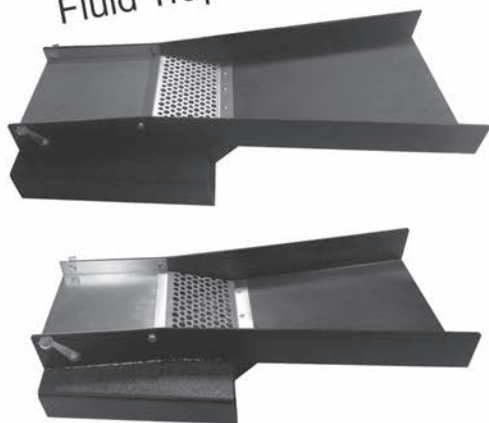


New ways to approach old diggings where you have found gold can sometimes lead to great new finds. Here the author took a drywasher to a location where he had found gold with a metal detector.



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(Above) Sometimes “going big” at an area where you have had past success can pay off. This area had produced gold but was played out. Scraping this area with a dozer allowed much more gold to be found. (Below) Many prospectors will focus only on placer gold, while looking at old hard rock mines like the one below can provide loads of new prospects and opportunities for finding gold.

miners will have coarse, easily visible gold in at least some of the ore. The size of the gold is not always reported in the geology reports, so it frequently takes going out to the mine and looking at the dump rock to determine what potential the mine has. In a number of instances over the years, I have found specimens on old hard rock mine dumps that have visible gold in them. The old-timers didn't intend to throw out nice, visible gold specimens on the dumps, but once in a while they did so by accident.

Look Before You Leap

An important source of information for the prospector is aerial photographs. When I started out, these were very tough to get. The quality was low and they were nearly impossible to find. The Internet has changed all that. The quality is amazing and locations all over the world can be viewed on Google Earth.

I used to have a tough time making out a car in aerial photos, but now I can see extreme amounts of detail



like individual branches in trees, and narrow paths trod by deer and other animals. I can tell the difference between natural rock outcrops and hand-stacked piles of rocks left behind by old miners working placers. I can also see some very small mine workings.

Sometimes rock features and patterns that cannot easily be seen at eye-level on the ground are obvious in a view from far up in the sky. These include scraped nugget patches where miners have removed the brush to work a productive nugget area, even if the brush has partially grown back. You can sometimes see rock contacts that may be mineralized and extend far beyond the area you were initially looking at.

Another important thing on aerial photos is roads that are not shown on any map but could provide easy access into places that otherwise seem nearly impossible to reach. You can often see in advance which roads seem overgrown or the ones in the best shape and most commonly traveled. Selecting the right access road can really save a lot of time.

Establish a Plan of Action

It is not enough to just have a place to go—you need to have an idea of what you are looking for and how you will find it when you get there. You need a plan to guide your actions in the field. I find I am more productive if I have put together a list of what I want to look for when I get out and explore. Sure, you can change your plans as needed, but at least start out with a plan for how you will find gold at this location that you will be working.

Use Information to Your Advantage

Another thing that goes with having a plan is maps, GPS and notetaking. Maps and a GPS device will help you know exactly where you are and ensure that if you make a decent discovery, you can get back to this productive spot. You want to find gold, not be the origin of a lost miner story.

A great thing about Google Earth is that it also ties in well with GPS. When you get home with your notes and readings, you can check them against Google Earth and any maps you may have. Use your GPS when you are in the field to guide you to the points of interest you have identified to explore. Don't wonder if you have



A GPS device and good maps can help you re-locate areas where you had success in the past and help you to properly check new locations.

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Know the Land and Claim Status Before You Go

When exploring new areas, it's good to have an accurate idea of the mining claim status in the area. This is true even if you are only looking to explore some club claims; it can be handy to know about any of the other claims located around those club claims.

The BLM's LR2000 data system gives the public Internet access to the BLM's claim records, although using LR2000 is a whole skill in itself. In order to use the LR2000 website, you will need to know the specific area you are interested in researching. You must know the coordinates of the location within the federal land survey system, which includes the section, township and range. The USGS topographic maps will show the sections, etc., of this survey. These online records will allow you to search individual sections to see what existing mining claims are out there, and which of them are active or inactive.

Conduct a Thorough Review

Researching and exploring to find new areas is a lot of work, and many of your trips to new areas will be unsuccessful. But there are lessons to be learned even from unsuccessful exploration trips. You can still learn a lot about these new locations through study, but reviewing what you did and did not see, and when you find a good new spot with good gold, it will be all the more rewarding. Your prospecting experience is cumulative and you can take what you've learned in the past and use it to grow, whether successful or not. Even a failure to find good gold can be instructive and help you find gold next time out.

Associate Editor Chris Ralph has a degree in Mining Engineering from the Mackay School of Mines in Reno. He has worked for precious metal mining companies conducting both surface and underground operation—sand has continued his interest in mining as an individual prospector. He can be reached at PO Box 3104, Reno, Nevada 89505; or via email at chrisralph@icmj.com





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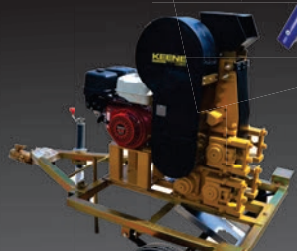
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MINER'S CALENDAR

Due to ever changing COVID-19 restrictions, we are adding and updating these events in our online Miner's Calendar section as often as possible, but it is recommended you confirm directly with each event's website before attending.

July 4-5, 2020

Roseville, California

RESCHEDULED! The 58th Roseville Gem, Jewelry, Mineral and Fossil Show. Hosted by the Roseville Rock Rollers at The Grounds, 700 Event Center Dr., Roseville, CA.

July 17-19, 2020

Baker City, Oregon

Annual Miners Jubilee 2020, sponsored by Eastern Oregon Mining Association is tentatively scheduled to be held in downtown Baker City. See video and other details at <https://minersjubilee.com/> (Official decision to hold event will be posted after July 1.) ☺

September 5-6, 2020

Sonora, California

Gold and Outdoor Swap Meet, hosted by the Delta Gold Diggers, at the Motherlode Fairgrounds, 220 Southgate Dr., Sonora, CA. See our ad on page 23. Visit website for details: <https://deltagolddiggers.webs.com/> ☺

September 28-30, 2020

Las Vegas, Nevada

POSTPONED! MINExpo 2020 has been postponed until September 2021. Visit <https://www.minexpo.com/> for updates on venue date and location.

October 13-18, 2020

Keene, New Hampshire

RESCHEDULED! Best O New England (BONE) Treasure Hunters Week #27, sponsored by the Professional Treasure Hunters Historical Society. Visit: www.streeter.org or email: gfs41@yahoo.com ☺

“☺” denotes that complimentary copies of *ICMJ's Prospecting and Mining Journal* will be available, and a staff member or the editor may be present.

If your organization has scheduled a special event and you would like it included in this calendar, use our online event submittal form. Go to www.icmj.com and look under the “Resources” tab for “News & Events” and then “Miner's Calendar.”



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POLYMETALLIC SKARN DEPOSITS

by Dean Delahunt

Polymetallic skarn deposits are an interesting class of deposits that can contain a number of different types of metals. They range in size from small to very large, are important producers of many of these metals, and because of this are worth investigating. They are nearly always associated with bodies of intrusive rocks, most often associated with felsic (granitic) classes of intrusive rocks, but can also be associated with more gabbroic types as well. The heat of the magma intrusion causes changes in the nearby rocks (metamorphism) where sedimentary rocks are present. This process can create a wide variety of valuable mineral deposits.

Defining Skarn Mineralization

The term "skarn" or tactite describes a high temperature contact metamorphism/metasomatism process which produces a calc-silicate and oxide/sulfide mineralization in carbonate, clastic and igneous rocks. There are three types of skarn mineralization caused by thermal effects and related passage of fluids emanating from a nearby igneous source. First of these is the pro-grade or high temperature anhydrous (lacking water) contact skarn, aka "skarnoid." Common skarnoid minerals are garnet, pyroxene, epidote, calcite, and jasperoidal quartz. These form in close or proximal contact to an igneous source rock (i.e. granitic intrusives and dikes). Exoskarn forms later than skarnoid along favorable stratigraphic bedding and faults in sedimentary rocks such as limestone, dolomite, siltstones and sandstones. (Exoskarn is a skarn of igneous origin that occurs at and outside the granite that produced it.)

Typical exoskarn minerals include amphiboles, pyroxenes, epidote, zoisite, wollastonite, vesuvianite, magnesite, quartz, sulfides and oxides. Endoskarn are skarns that are formed within the granite intrusive itself. Later retrograde alteration of exoskarn by hydrothermal fluids can deposit economic concentrations of copper, lead, zinc, gold, silver, iron, tungsten, molybdenum, beryllium, tin, magnesium and fluorite. These are the minerals most sought after

by miners. The composition of fluid controls the skarn and the types of metals that are deposited. The ore deposits in this category vary in type with the chemistry of the associated intrusive body, the depth of emplacement of that body in the earth's crust, and with distance of the mineraliza-

tion away from the intrusive contact. Retrograde alteration skarn minerals are serpentine, chlorite, actinolite, humite, talc and tremolite.

Types of Skarn Ore Deposits

Copper and molybdenum skarns are associated with porphyry intrusives (i.e. granodiorite, quartz monzonite, granite) both proximal (near the center) and distal (away) from the contact with carbonate and clastic rocks surrounding and within the ig-



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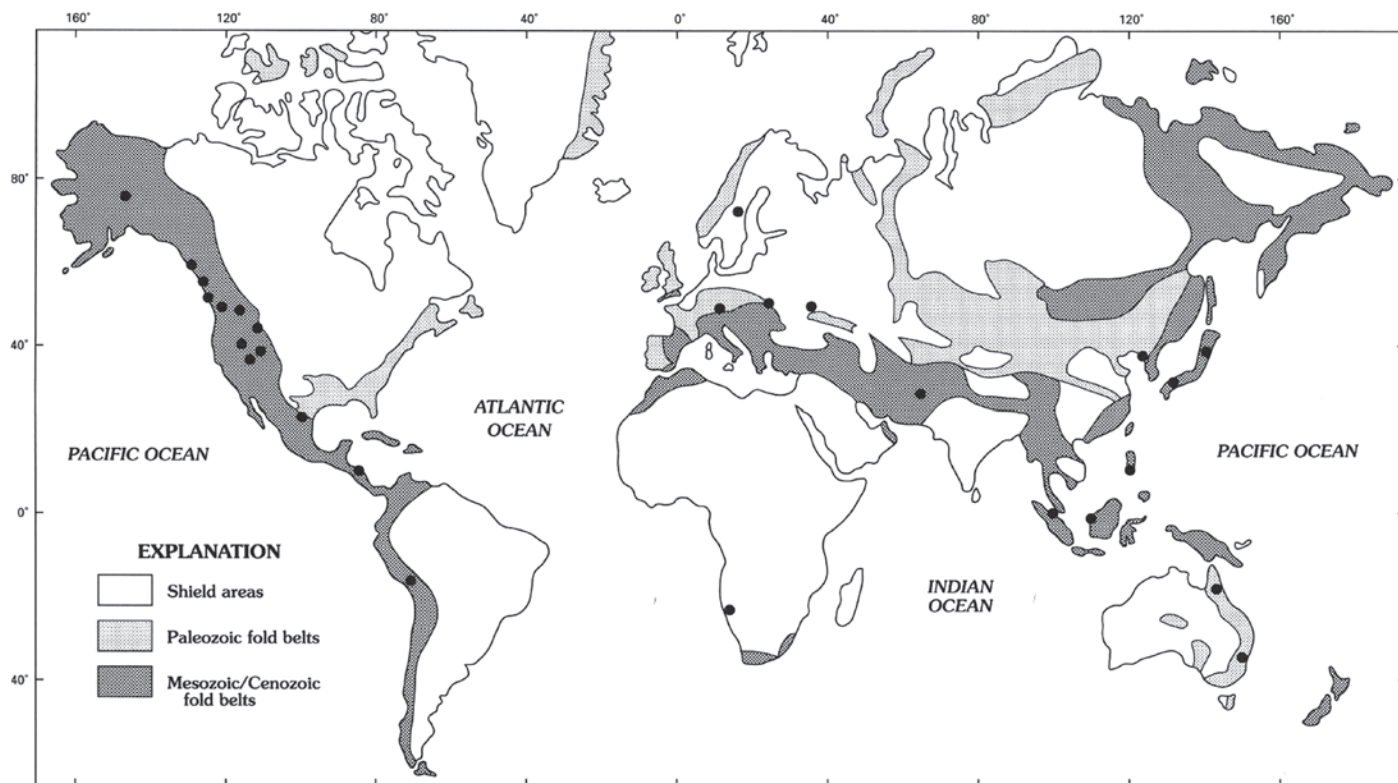
neous intrusive. Copper skarn sulfide ore minerals are chalcopyrite, pyrite, tetrahedrite, covellite, bornite, enargite. Oxide and carbonate copper ore minerals that form from the alteration of these sulfides include malachite, azurite, chrysocolla, cuprite, brochantite, and turquoise. Copper skarns are extensive at Bingham Canyon, Utah; Yerington and Robinson, Nevada; Bisbee, Arizona; and Butte, Montana. They have been important

copper producers at a number of other districts as well. Molybdenum skarns are commonly found in marble host rocks but form at deeper levels in the crust than the copper skarns.

Tungsten skarns are deposits of scheelite (calcium tungstate) deposited in both skarnoid garnet-pyroxene close or proximal to granitic intrusive and in distal exoskarn where the metasedimentary rock bedding is favorable to ore deposition. Tung-

sten skarns form at deeper depths and higher temperatures than the copper skarns. The Pine Creek tungsten, molybdenum and copper skarn deposit near Bishop, California is a scheelite, molybdenite and chalcopyrite ore mineralization hosted in marble retrograde altered skarn comprised of dark andradite garnet, diopsidic pyroxene, tremolite, talc, actinolite and chlorite.

Iron skarns are predominately



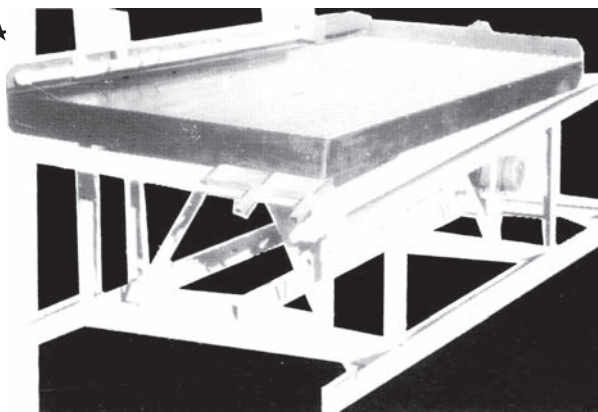
The distribution of known gold skarn deposits. This shows the relationship of these rocks to belts of folded rocks.

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magnetite-hematite orebodies in lenses and stringers within carbonate rocks both proximal and distal to intrusive pluton or dikes in retrograde altered exoskarn. The Eagle Mountain and Vulcan mines in Southern California are iron skarns. The Pumpkin Hollow Mine near Yerington, Nevada is an iron skarn with important amounts of copper.

Skarns with economic concentrations of beryllium, tungsten, zinc, tin and fluorite are often associated with mica-rich altered or “greisenized” dikes that crosscut both the intrusive and host carbonate and clastic rocks. (“Greisenization” is a process of hydrothermal alteration in which feldspar and muscovite are converted to an aggregate of quartz, topaz, tourmaline, and lepidolite.) The deposition of fluorite in the marble contact skarnoid and exoskarn can actually result in an increase in volume or fracturing of the marble enhancing skarn calc-silicate and associated pegmatite vein formation. Rare earth minerals can be occasionally found in these greisenized pegmatite dikes as well. The McCullough Butte skarn deposit in Eureka County, Nevada is a world-class fluorite orebody with greisenized dikes with beryl and scheelite mineralization within the upper or apical portions of a granitic intrusive.

Gold skarns are hosted within both the metasedimentary carbonate and clastic host rocks associated with igneous intrusive rocks. Gold mineralization is associated with both iron, copper and bismuth mineralization in retrograde exoskarn calc-silicates and sulfides. Where retrograde alteration of iron-rich pyroxenes (hedenbergite) deposits pyrite-arsenopyrite, gold mineralization can occur. Key pathfinder elements in geochemical prospecting for gold skarns are arsenic, bismuth, boron, and tellurium. The mineralogy of gold skarn deposits includes actinolite, hedenbergite pyroxene, potassium feldspar, chlorite, clinozoisite, fluorite, magnetite, quartz, chalcopyrite, galena, pyrite, pyrrhotite, marcasite, bismuthinite, chrysocolla and native gold. The following describes two world-class gold skarn mines:

McCoy-Cove Mine

The McCoy-Cove open pit mine was operated by Battle Mountain Gold in the late 1980s-90s. It comprised an orebody of six million tons with av-



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average grade of 0.054 ounces per ton gold approximately 30 miles south of Battle Mountain, Nevada. Gold with subordinate amounts of copper and silver mineralization were hosted in the Triassic Augusta Mountain sequence of limestone marble and intrusive quartz monzonite of the Brown Stock. A halo of skarn gold mineralization was mined up to 600 feet distally from the Brown stock as

a sort of flat-lying or wedge-shaped ore body in strataform, bleached marble exoskarn. Dikes intruded along a one-mile-wide zone were key to forming the skarn gold ore mineralization. Ore hosting exoskarn and later retrograde skarn was comprised of garnet, diopside clinopyroxene, chlorite, limonite after pyrite, actinolite, chalcopyrite, magnetite, pyrrhotite and chrysocolla. A correlation of cop-

per and iron mineralization to the gold ore was identified by geologists. Higher grade gold mineralization occurred where the intrusive to marble contact zone deviated from vertical to horizontal, creating a situation where gold-rich hydrothermal fluids "ponded up" under the calc-silicate marble exoskarn. Some gold ore was deposited within endoskarn rocks formed with the intrusive quartz monzonite comprised of orthoclase, epidote, actinolite and calcite.

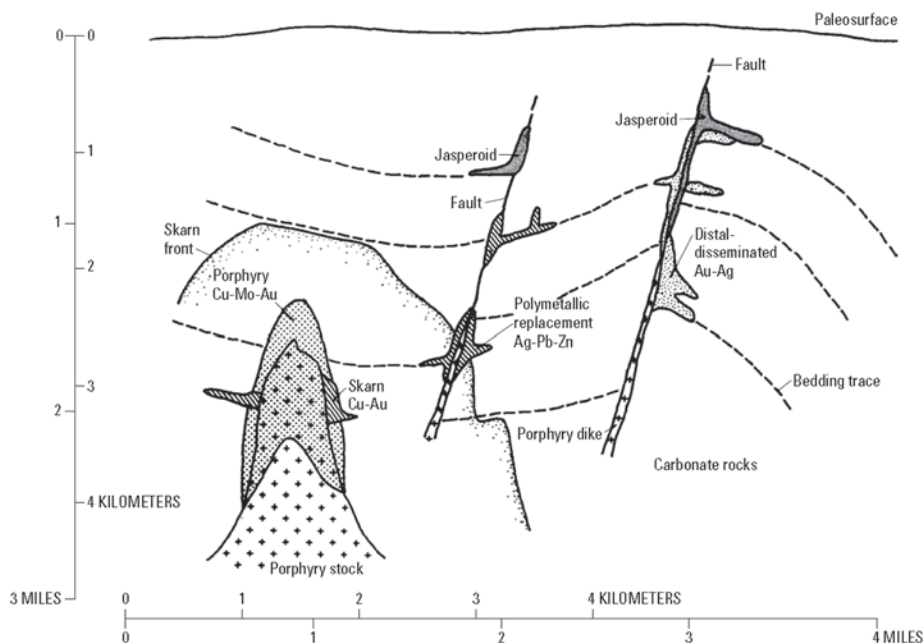


Diagram showing the association of skarns with other types of deposits, including porphyry copper-gold-molybdenum polymetallic replacement deposits and distal disseminated gold-silver deposits.

Crown Jewel Mine

Located in the Buckhorn Mountains of north-central Washington State just south of the Canadian border, the Crown Jewel mine is a gold skarn hosted in Triassic clastic and carbonate rocks of the Thompson assemblage intruded by a granodiorite intrusive. The orebody comprised 8 million tons at an average grade of 0.163 ounces per ton gold mined by Battle Mountain Gold and Crown Resources in the 1990s. Gold ore was hosted in retrograde altered exoskarn calc-silicates garnet, hedenbergite pyroxene, epidote, calcite, quartz, magnetite, pyrite, bismuthinite, pyrrhotite, cobaltite and gold. Gold mineralization was both proximal and distal to the intrusive and was correlated to deposition of magnetite, bismuth and cobalt. There was no association of copper and arsenic to gold mineralization. Kinross began production in 2009, but closed in 2017 after nine years in operation, producing more than one million ounces of gold.

Keys to Prospecting

Polymetallic Skarns for Gold

Polymetallic skarns are a complex class of mineral deposits with distinctly-zoned portions that are rich in calc-silicates, sulfides and oxides. Lower grade portions of the deposit may hide higher grade portions. The key to prospecting for them is to be able to identify the typical skarn minerals in the field including their alteration products. Recognizing skarn outcrops and the skill of taking representative samples for assaying is also important. Gold-rich skarn deposits are typically developed mineralized, fracture-enhanced exoskarn systems.

Indicators for prospecting include gold placers in regions where skarn rocks have been found, especially if

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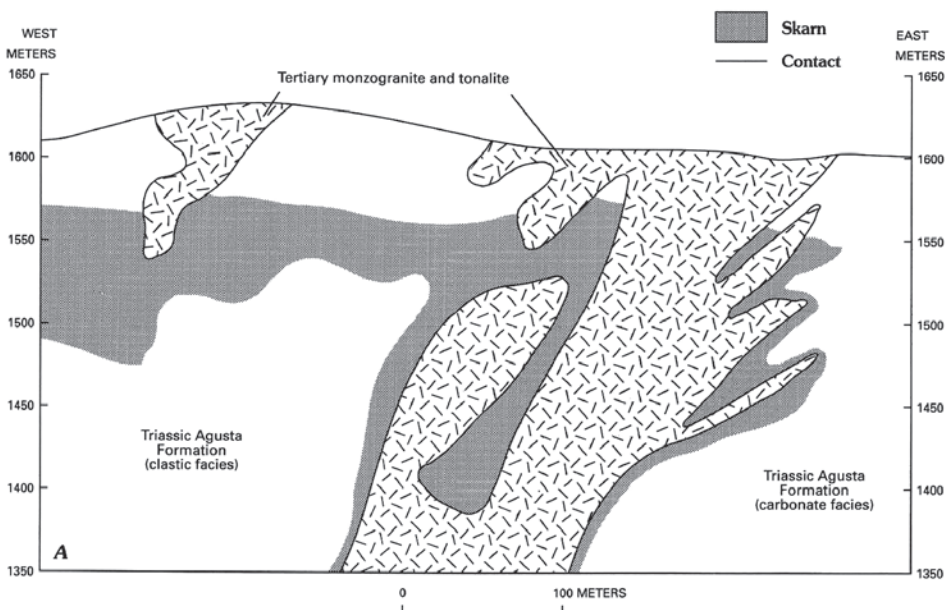
the placer gold is associated with bismuth minerals, or the placer concentrates contain bismuth minerals including bismuth oxides or bismuth tellurides. However, the placers associated with gold skarns are not usually large or especially rich. Often the gold is fairly fine-grained in size, though coarse gold can sometimes be found.

Polymetallic veins or polymetallic replacement deposits with bismuth and tellurium-rich geochemical signatures and sulfide mineral assemblages similar to those found in gold-bearing skarns may indicate the presence of gold skarns nearby. Faults cutting skarns and intersecting structures are important pathways along which mineralized fluids may have deposited ore minerals. Another guide indicating a good location to explore would include any reported gold in known base-metal and ferrous-metal skarn systems. Some very significant gold grades can occur in certain copper-rich skarns.

Plotting the locations of known skarn mineralization on a topographic or Google Earth map may

point toward the location of skarn mineralization. The nature of the potential sedimentary host rocks and igneous intrusive rocks is im-

portant to understanding where possible ore deposits may have formed. Well-developed local magnetic highs may result from an abundance of



A geologic cross section of the gold skarn deposit mined at the McCoy Mine in north-central Nevada, showing the relationship of the intrusive monzogranite and tonalite rocks and the gold-rich skarn deposit. (Image courtesy USGS.)



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pyrrhotite and/or magnetite in some Au-skarn systems, providing a possible geophysical indication for these deposits.

Due to their complex mineralogy and geologic relationships in the field, polymetallic skarns and their associated mineral deposits remain difficult targets for exploration and prospecting. Because of this, they don't usually rate very high on the scale of deposit types that exploration companies are typically searching for. They have likely been overlooked in some areas as potential targets for economic ore deposits of gold, silver, copper, lead, zinc, tungsten, iron and beryllium.

The author is a mining geologist and graduate of the Mackey School of Mines. He has worked at a number of mining operations over the years and currently is working at the Gold Road Mine Company operated by Para Resources near Oatman, Arizona. He welcomes questions or comments via email at: deandelahaut@gmail.com



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PLP UPDATE by Scott Harn

States continue to block miners from mining their federal mining claims across the West by requiring a Section 402 Clean Water Act permit. The Clean Water Act clearly states the "addition" of a pollutant is the trigger, but these states continue to ignore the law and they've been backed by liberal courts like the Oregon Supreme Court and the 9th Circuit Court of Appeals.

We were looking forward to the US Supreme Court finally weighing in on this Section 402 permit issue in *Eastern Oregon Mining Association v. Oregon Department of Environmental Quality* after the miners appealed a decision from the Oregon Supreme Court. But the US Supreme Court accepts less than 3% of the cases it receives for review and, unfortunately, this wasn't one of them. So now what? Where do we go from here?

We here at the *Mining Journal*, along with Public Lands for the People, have been working with a few folks in Washington, DC, on this issue for the past year. Last year, Donald Smith, a miner in Idaho, was dealing with the same permit issue, and we gave him a hand with writing a petition for rulemaking addressed to the EPA. (Section 402 permitting

is handled by many of the Western States under a memorandum of understanding with each state.)

We've built up some contacts in DC during our trips there over the past four years, and we believe we finally have the correct contacts who can get this petition reviewed by the proper people. We've been in touch with them over the past two weeks and we were hoping to have further news to report on this process, but we didn't get any confirmation by press time. We are asking for the EPA to provide clarification to federal and state agencies that a Section 402 permit is not required for suction gold dredging because there is no addition of a pollutant. We will certainly keep you posted.

On another note, we are also talking with Trump administration officials about providing relief in many other areas, and what is the best and quickest route to provide that relief.

As all of you know, the House is currently controlled by Democrats while Republicans control the Senate. Many members of Congress are too busy fighting with each other and worrying about re-election to get anything significant accomplished so we are in active discussions about a more efficient alternative with some of our DC contacts.

I can't give any specific details on this effort at this time, but will certainly let our readers know when that opportunity arises.



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PRACTICAL ADVICE FOR MILLING HARD ROCK ORES

by Chris Ralph

I've noticed that a large number of prospectors are starting to take an interest in hard rock ores. After all, the old-time miners produced a lot of gold from the hard rock sources they found. The problem is that extracting gold from hard rock is often a lot more difficult than processing placer gravels. Still, there is some very high-grade ore out there in many old mining areas. I recently processed a pound of rock I collected with my metal detector and ended up with nearly a half ounce of gold—that's a pretty good result! What I want to write about in this article are some of my recent experiences processing some different gold ores that I have collected from various sources over the years.

Hard rock ores come in every possible grade, from super-rich to barren, and while there is some good ore out there to be found, there is a lot more low-grade than high-grade. Prospectors normally find that most of the ore left behind at old mine sites is low-grade. The old-timers didn't leave the good stuff behind without any reason! That's why it's important to be selective about any ore you collect for processing and do thorough testing before you commit to any large-scale ore processing. The other thing about hard rock gold is that the gold tends to be mostly in the small size range. Sure, there are veins with coarse gold, but the majority of hard rock gold found in quartz veins runs on the small side. This means any system you operate to capture the gold out of hard rock ores needs to be good at catching fine gold.

Milling hard rock ore is a lot more work and the cost of the equipment to process the rock to extract gold is expensive. Very small tests can be crushed by hand with a mortar and pestle. This type of equipment, with a larger version sometimes called a

dolly pot, can be homemade fairly easily if you have access to welding equipment. It is more or less like a stamp mill that runs on muscle power. However, even with the larger dolly pots, you will still find that this is a lot of work as a method to crush rock. The advantage is that it is cheap. You can carefully pan out the crushed quartz and see the results of your test quickly. I use a small jaw crusher and a chain mill to crush my rock down to size.

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get all the gold out of hard rock ores. Different ores may require different techniques to capture the gold they contain. The big mining companies use a lot of cyanide, but most small-scale miners and prospectors don't want to deal with chemicals, especially toxic and dangerous ones. Luckily, a lot of gold ores—especially higher-

grade ones—have a significant part of their gold in the form of free metallic gold in the ore. This type allows that a simple crushing and careful gravity-based processing will get the majority of the gold out.

Reliable answers about the grade of your rock are important before spending lots of money on equip-

ment, because no one wants to spend a lot of money unless there is a good chance of getting a profitable return on your investment in milling gear. Small tests of a pound or two are a good start, but can still be misleading, because with free gold ore there is often a problem of what miners call the “nugget effect.” Small spots of ore



(Left) Most gold from hard rock mines is small, like this fine gold. The miner must set up and adjust his recovery equipment with the size of the gold in mind. (Right) The author uses this small jaw crusher to reduce the size of his ore before he runs it through his chain mill crusher to reduce it down to the correct size for processing. The crusher was originally intended for use in an assay lab.

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in a vein are often much richer than the average.

If you take a small sample, a few rich rocks within the whole sample may tell you that your sample shows really high values. But if you took a much larger sample to get a better average, you might find that a small amount of really high-grade stuff was throwing you off and the average grade is actually not as good. The same thing can happen if you miss out on those rich pieces; then your test will show the ore is low-grade when it actually is acceptable. This is why reasonably larger-sized test lots are important for the small-scale miner to get accurate results before investing lots of money. Usually this means crushing samples of 50 to a couple hundred pounds of rock so you know what you have as an ore grade is accurate. This is a lot more work than processing a sample with just a couple of pounds, but the information it will give you will be a lot more accurate.

This brings us to ask how small one should crush their ores for processing. This is a whole topic unto itself and some miners want to crush their ores down to a size that is too small. There is a point where it is possible to crush your ores too fine and you will actually lose gold because it becomes harder to recover. Super fine ore, called slimes by the old-timers, are difficult to process by any method. The old-time stamp mill operators most often crushed their ores to something around 20 to 30 mesh—and they had a lot of experience. (We had an excellent article on this topic just a few months ago in our February 2020 issue. I urge you to take a look at this article on determining the optimal crush size for a hard rock ore. I don't need to cover that topic further, so we will now focus on the processes of getting the gold out of the ore once it has been fully crushed.)

Many mines treat sulfide-rich ores by flotation and then cyanide leaching for what is not caught by flotation. I will do an article later this year on practical work with some non-cyanide leaching methods, but for now we will focus on gravity-based systems for catching free gold. There are a number of types of gravity-based systems designed to catch free gold using its density. The most common of these fall into one category or another and the best known types include shaker

tables, centrifugal bowls and sluice systems. Shaker tables and centrifugal bowls are often the choice of larger commercial operations because of their high efficiency in catching small gold. Unfortunately, they are a lot more expensive to purchase. Sluice systems are often what smaller-scale operators choose because of their comparatively low cost—at least to start with for testing and initial small-scale gold production.

If they are operated properly, sluice systems can catch some very small-sized free gold.

You need answers about the ore you have before spending loads of money to set up a larger-scale milling system. So let's talk about how to how to run a sluice correctly to catch fine gold.

The first consideration is how you will set up the sluice box. Factors like the box angle and the amount of water flow are extremely important. There is no fixed angle that always works because the box angle depends on the amount of water flow. For the best fine gold recovery, you want to use the minimal amount of flow needed to move the material at a reasonable speed.

A steeper box angle will speed up the water flow, but remember you don't want your material to shoot down the sluice at a super high speed, and you don't want it to just sit there and hardly move. You want a flow that will allow the material to move steadily down the sluice at a reasonable speed. If too slow, steepen the sluice or increase the flow. If too fast,

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flatten the angle or cut back on the water flow. In all cases, you want to minimize water turbulence. Boiling, turbulent white water flying down a sluice is the enemy of good fine gold recovery. You have to give the gold a

chance to settle into the mat before it goes out the tail end.

I know there are plenty of claims to the contrary, but no sluice mat is magical. People have strong opinions, but mats are not magic be-

cause essentially all of the new ones on the market, if run properly, will do a good job (and if operated very poorly will not do a good job). I use the old standby of miner's moss because it has good capacity for storing concentrates. You do want a mat that at least has some capacity volume for concentrates.

Another important thing about getting the best fine gold recovery in a sluice type system is screening the feed material to a smaller size. The flow speed it takes to wash away large gravels is the same amount of flow it takes to wash away very small gold. Your ore may come out of a crusher at minus 20 or 30 mesh, and in that case no additional screening is needed. But if you have larger materials in there, you want to screen it down.

One of the things I want to talk about is the assumption that if you get some very small gold, you can be confident that you are getting nearly all of the gold that size. That assumption is simply untrue. If you get some fines, you cannot assume you are getting a majority of them. This is a mistake a lot of miners make. It's perfectly possible to see a certain amount of fine gold in your concentrates but it could be only 10 or 20 percent recovery of all the fine gold that was originally in your feed material.

Wetting the crushed ore before you run it through your sluice is important. I see miners dumping stuff in dry and it wants to float until it is fully wet, which may take it quite a ways down the sluice before it can possibly be caught. This makes it harder for your sluice to catch the gold and other values. If your ore is super fine in size, the fines will want to clump like clay when you wet them, also causing values to roll down the sluice as clods and not be caught. This is partly why some miners add material dry, but neither choice—dry material or wet clumps—will give you good recovery. I struggle with this sometimes to get my feed mixed into an acceptable slurry rather than a soup of clumpy clods. Slimes make things rough either way when it comes to processing. Adding ore with lots of water and no clods is the right choice.

I also use Jet-Dry to prevent any gold from floating and help recover the sulfides. Jet-Dry causes particles to wet properly, which allows them to settle out faster in your sluice. There are other similar wetting products,



A centrifugal bowl is a great piece of equipment, but it is often too expensive for an operator just starting out. Some sort of sluicing operation is the normal first choice for prospectors just getting started in hard rock ore processing, and moving up to a centrifugal bowl is reserved for ramping up the operation after a significant deposit is found.



This is a close-up of some of the ore the author is currently working on. It's from a gold mine in Nevada with minor silver and a little copper, which can be seen as green and blue specks on the ore.

and even liquid dish soap works but it causes lots of foam.

Another important thing to remember is to feed the material into the sluice slowly and evenly. Dumping a large shovelful into the sluice all at once also overloads the riffles and allows fine gold values to roll right on out of the sluice. A slow and even feed is the way to go and allows the sluice to operate properly, catching the heavy values in the ore.

My experience with testing recovery by sluicing methods shows you need to keep an eye on the process and test your recovery rates. You might consider running your ore twice or even three times through the sluice box, at least at first, to make sure you are getting a good recovery. Testing your tailings is extremely important until you know everything is working properly and you are getting a high recovery rate. Remember my comment: just because you get some fine gold does not mean you are getting the majority of it.

Test your system and make adjustments as necessary. Especially when you are building something on your own, you have to keep testing until you are sure it's working the way you want.

I also always save the sulfides from my ores, even after I've recovered all the free gold from the concentrates. There are almost always tiny particles of gold inside the pyrite and other sulfides. There are techniques for roasting or bio-oxidizing pyrites and other sulfides to free the contained gold that will allow you to collect the values the sulfides contain.

In the end, success in processing hard rock ore is all about all about the grade of the ore. Low-grade is abundant and easy to find, but it's not worthwhile to work it. Processing hard rock ores is work and you want to get a decent return for the effort you put in. Higher grades are out there, but harder to find. In a previous article I mentioned stumbling across small piles of ore that were stockpiled but somehow never got shipped and these can sometimes be really worth the effort to process. Determining if the ore from a mine is worth working requires some testing and sampling, and larger test lots give more accurate information. A good set up to process those larger lots of hard rock ore can make it a lot easier to do.



The author feeds his recirculation sluice with crushed hard rock ore. Note the smooth flow of water down the sluice box, not moving too fast or too slow.

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SPEED PROSPECTING FOR HARD ROCK GOLD

by Keith Bowen

One of the challenges of gold exploration is that the gold itself is rarely visible in the field without some sort of processing. Placer miners make up for this by using

digging tools, sieves and pans to recover the gold while still at the prospect and this gives them the ability to rapidly and cheaply (if not without effort) determine where

the gold is located and define its grade and extent. Hard rock miners have it tougher.

The usual method of determining the gold content of a rock sample is a laboratory analysis called an "assay." There are several different general methods, but the fire assay has been around the longest, wherein the sample is melted with a flux in a furnace and the gold and silver are extracted with the help of a collector metal and then weighed.

The biggest problems with assays are that they are expensive and time-consuming. First you take the sample, then package the sample, take it to the lab, they work their magic, you pay them generally about \$50 per sample, and then they give you an answer usually weeks later. You can see how cumbersome and expensive this is and how it will not help you at all while still in the field.

Using this method, you are sampling mostly in the blind and hoping you sample the right spots. If the target location is many miles from home, you will spend a lot more time and money just getting back again before you can utilize the information from the first samples to guide your next sampling. Thus, there is a need for fast and reasonably accurate field assays to guide the sampling in real time. I have been working on such a method for years and have developed one that works reasonably well in most circumstances that I call "speed prospecting."

There are some inexpensive colorimetric chemical assays that can provide some help in field testing, but I am not familiar with them as they are more cumbersome than speed prospecting and don't recover the gold in its original form, which provides very useful information. There are also XRF (x-ray fluorescence spectrometers) instruments that bombard the sample spot with x-rays and then analyze the re-emitted energy. I have only had this type of instrument used on some of my samples once and was not impressed. It showed ALL the samples to have roughly 1 ounce per ton (opt) platinum that could not be confirmed by laboratory assay.

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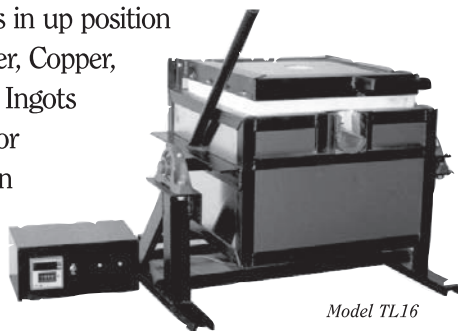
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with all talking at once, with most of the voices much louder than the one you seek. It is a very challenging problem that to my knowledge has not been satisfactorily solved for the in-the-field precious metals explorer. It does work well for alloy analysis and elements of much lower value that must be present in much higher concentrations to be of interest. For base metal prospecting they

can be quite useful. They are quite expensive though and still don't tell you the particle size and shape of the target element.

This situation left me with a burning desire to rediscover the panning methods the old timers used for field analysis. I had even talked with a field geologist who had seen one method performed with a small dish made of cow's horn. But without a

ready supply of cow's horn dishes and specific instructions, that idea seemed impractical to me. An online video gave me some ideas, and with a lot of trial and error I developed a reliable method of panning free gold particles down below 35 microns quickly and easily.

The basic panning technique for micro-fine gold has been described in a previous article in the May 2017



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ICMJ (Vol. 86, No. 09). (A video of this technique is included in the "Videos" section at www.icmj.com under "Resources.")

Here are the basic steps:

1. Crush and/or screen the rock to between 16 and 30 mesh minus.

2. Measure 2 cups into a 10" finishing gold pan. (The pan should have modest ripples at most and no vertical edge between the bottom and the side. I prefer the Stansport 10" black gold pan.)

3. Submerge the pan in water treated with 1/2 tsp Jet-Dry rinse aid per gallon.

4. Wet all the material in the pan.
5. Agitate the pan while holding horizontally until fluidized.

6. Maintain the agitation for a minimum of fifteen seconds.

7. Then, while still agitating, tip the pan until about 1/4 of the material has flowed over the edge.

8. Bring the pan back to horizontal and repeat until you only have a teaspoon or two left in the pan. (My experiments have shown me that with free milling gold, very little will be lost in the tailings at this point.)

9. Move the pan to some clean water and Jet-Dry.

10. Shake the material into a pile in the bottom corner of the pan.

11. Rotate the pan to where the pile is directly away from you.

12. Put about 1/2" of water in the pan by pushing the near side of the pan slowly under water so the flow does not disturb the pile of material.

13. Hold the pan on the left-hand side and let the near edge drop just a little from horizontal.

14. Tap the pan gently just to the right of the material, striking towards you and slightly to the right until the lighter material travels far enough towards you to reveal the gold.



The working face at the cut. I thought the best ore was in the dark zone just in front of me. Instead, it was near where the orange electric cord is hanging down. Note the yellow paint to mark the different zone boundaries and the number of structures present.

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This method uses some surface physics to hold the very fine gold in place while everything else moves away from it. The typical swishing method used by placer miners will not do it effectively. By using this method, I can reliably detect free milling gold down to .01 opt in most ores. Thus, we now have a useful way of detecting free gold and estimating the ore grade in the field.

The first step in speed prospecting is to obtain representative samples of the structure in question. A channel of approximately consistent width and depth is first carved across the rock and the material collected. Adjust the width and depth of the channel to the width of the formation to get the right size sample. A tarp can be invaluable in this process to collect the sample. Also, a hammer and chisel will usually work better than swinging a rock hammer, but an electric demolition hammer is easiest if that is available. Sample each rock type separately. If the vein seems to be made of more than one layer, sample each layer separately. Put each sample into a clearly labeled bag or bucket.

Pulverizing rock in the field can be difficult and time consuming, so I came up with a work around that seems to work in most situations. I usually take samples of one-half to 3/4 of a bucket in size and have found that if I simply screen that amount of material to 30 mesh I will usually get one to two cups of fines, which is about right for panning.

Now I take two 13" x 11" x 5" Rubbermaid wash basins and fill them about half full of water dosed with Jet-Dry and do the panning described above. This gives me a good idea of the grade, but is not definitive. Some ores, such as arsenopyrite, have very fine gold and don't show nearly as much in the pan as a good free-milling ore. But by running a couple of laboratory assays against a few low, medium, and high grade samples as revealed by the panning, you can usually get a reliable calibration for future panning.

Whatever the case, you will almost certainly be able to tell immediately with high reliability which samples are significantly better or worse than others. You can then use this information to rapidly zero in on the best material and quickly learn what indicator minerals there might be for

that particular spot. If you want to be precise for later assays, you can settle the solids in the basins for that sample and put them back in the bucket. (I usually have 4 to 6 basins with me and lots of water.)

Using this method you should be able to go to a strange location, use obvious clues like visible veins and existing workings to determine likely places to sample, then pan those samples and zero in on the best material before sampling that and taking it home for confirmation assays. In

most cases, one trip will let you know if there is anything of significant interest in a small target location and save future trips for only viable candidates for a successful mine operation.

It would be hard to overstate just how useful the ability to hand pan micro fine gold is. Not only can it improve your field productivity by orders of magnitude, it can also allow for efficient and easy monitoring of your extraction process.

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Videos depicting the techniques described here are available on the "Hard Rock University" YouTube channel. Watch video 97, "Speed Prospecting the Dreamer Prime," and video 103 "Speed Prospecting (with assays) Mojave 1 and the Dreamer Prime." They also show some of the sampling methods.

The author worked as an equip-

ment operator, driller, blaster and supervisor at several large mines, including the Mesquite and the Picacho mines in California. His current interests include developing hard rock claims in Arizona, perfecting his own extraction equipment, and developing a website dedicated to small-scale hard rock gold mining. He welcomes questions or comments via email at hardrocku@outlook.com



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Forrest Fenn Treasure Chest Finally Found?

Sante Fe, New Mexico (AP)—A bronze chest filled with gold, jewels, and other valuables worth more than \$1 million and hidden a decade ago somewhere in the Rocky Mountain wilderness has been found, according to a famed art and antiquities collector who created the treasure hunt.

Forrest Fenn, 89, told the *Santa Fe New Mexican* on June 7 that a man who did not want his name released—but was from "back East"—located the chest a few days prior and the discovery was confirmed by a photograph the man sent him.

"It was under a canopy of stars in the lush, forested vegetation of the Rocky Mountains and had not moved from the spot where I hid it more than 10 years ago," Fenn said in a statement on his website that still did not reveal the exact location. "I do not know the person who found it, but the poem in my book led him to the precise spot."

Fenn posted clues to the treasure's whereabouts online and in a 24-line poem that was published in his 2010 autobiography "The Thrill of the Chase."

Hundreds of thousands have hunted in vain across remote corners of the US West for the bronze chest believed to be filled with gold coins, jewelry and other valuable items. Many quit their jobs to dedicate themselves to the search and others depleted their life savings. At least four people died searching for it.

Fenn, who lives in Santa Fe, said he packed and repacked his treasure chest for more than a decade, sprinkling in gold dust and adding hundreds of rare gold coins and gold nuggets. Pre-Columbian animal figures went in, along with prehistoric "mirrors" of hammered gold, ancient Chinese faces carved from jade and antique jewelry with rubies and emeralds.

He said he hid the treasure as a way to tempt people to get into the wilderness and give them a chance to launch an old-fashioned adventure and expedition for riches.

Fenn told *The New Mexican* in 2017 that the chest weighs 20 pounds and its contents weigh another 22 pounds. He said he delivered the chest to its hiding place by himself over two separate trips.

Asked how he felt now that the treasure has been found, Fenn said, "I don't know. I feel halfway kind of glad, halfway kind of sad because the chase is over."

"I congratulate the thousands of people who participated in the search and hope they will continue to be drawn by the promise of other discoveries," he said on his website.



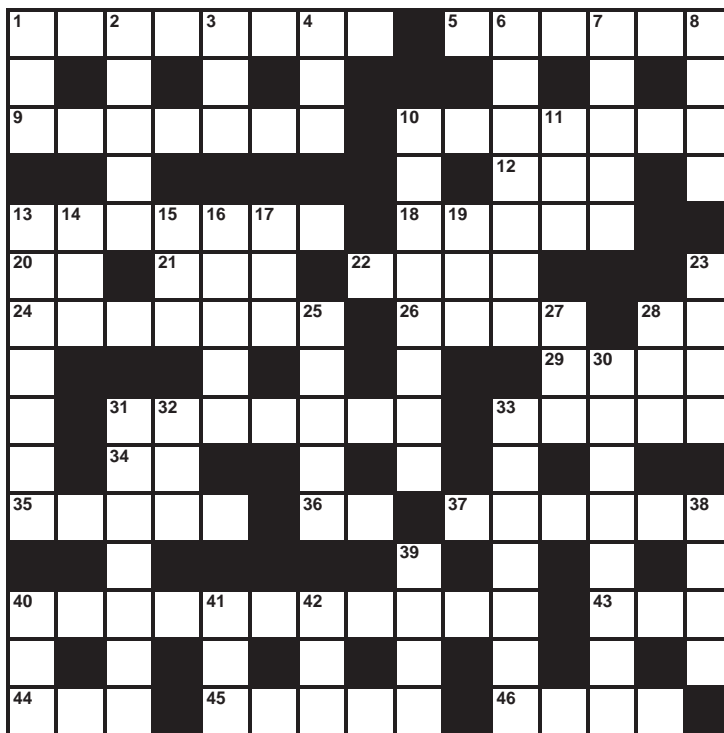
(Above and below) Forest Fenn posted photos of the treasure box and its contents after he claimed it was found.



Fenn posted photos of what he claims is the long-hidden chest and its contents after it was found, though some believe the whole thing was a hoax because he refuses to identify the finder. The photos show the treasure chest as it reportedly looked when it was discovered and Fenn going through the contents of the box, though he does not state how he obtained the box and its contents after it was reportedly found.



CROSSWORD by Myles Mellor



ACROSS

1. Ore excavation
5. Crystalline mineral
9. Tool for cracking stone, 2 words
10. Finds
12. Chinese cooking pan
13. Tools for rock breaking, 2 words
18. Valuable deposits
20. Europe, abbr.
21. The A in IPA
22. Miner's aids in locating sites
24. Unweathered rock under layers of soil
26. Past the expected time
28. Golden state, abbr.
29. Way much used equipment is sold usually, 2 words
31. Deep rift
33. Break into small pieces
34. 50th state
35. Profitable ore strata
36. Former
37. Clouded with sediment, like some streams
40. Twentieth of an ounce
43. Gold units, abbr.
44. Nothing
45. Return
46. Not often found

DOWN

1. Name
2. Natural trench
3. Little troublemaker
4. Weapon for self-defense
6. Disentangle
7. They make up the earth's crust
8. Pizzazz
10. Is worth less
11. Very long time period
13. Small stones
14. Regret
15. Gold ingot
16. When breaking rocks with explosives, never work ____
17. Recreation, slangily
19. Environmental watchdogs, abbr.
23. Separate dirt and gravel from precious minerals
25. Useful cutting tool while out in the wilderness
27. Order of corn
28. U.S.S.R. successor
30. Flat piece of gold lying out in the sun
31. Stream bed
32. Edge
33. Group of similar things
38. Powder from dry earth
39. Weather-beaten
40. Shallow container used by miners
41. Cry of success
42. Period just before an event or holiday

The solution can be found on page 64.



MELMAN

on

Gold & Silver

Leonard Melman

Leonard Melman is a Financial Writer residing in NanOOSE Bay, British Columbia, Canada. He had been involved in money management for over 40 years with particular emphasis on the precious metals. He was educated at the University of Texas, El Paso, majoring in economics and math. Leonard has been a regular contributor to the Journal for over 30 years. (Mr. Melman is a member in good standing of the Canadian Society of Technical Analysts.)

Melman on Gold & Silver is a monthly column in ICMJ. If you have questions or comments regarding this column, Leonard welcomes your letters or E-mail. Correspondence should be addressed to LEONARD MELMAN, 244-2465 Apollo Dr, NanOOSE Bay, BC V9P 9K2 Canada; email: lmelman@shaw.ca

In my introduction to last month's column, I wrote, "...Just three or four months ago, no one could have imagined that we would be reporting on a worldwide pandemic, collapsing economies, international deaths by the tens of thousands or streams of economic data reminiscent of the depths of the Great Depression..." Well, incredible as it may seem, in the opinion of many credible observers, the situation may have deteriorated considerably further over the past four weeks. I have selected four general topics to discuss below, including their potential impact on gold and silver. They are:

1) The rise of racial tensions, societal violence and the sudden emergence of calls to disband—or at least significantly reduce—police departments in many sections of America.

2) The continuing developments within the general topic of the coronavirus (or Covid-19) and the continuing debate whether there will be a "second wave" of the pandemic which will cause further economic and social disruption.

3) A discussion of the economic trauma that has already been caused around the globe, and the measures various governments are taking to "stimulate" new economic activities.

4) Whether the resultant staggering growth in national debts, governmental deficits and the impact of already-planned stimulative measures will ultimately result in future waves of escalating inflation.

In addition, the pandemic has already had a negative impact on one of mining's most interesting ongoing stories, the suggested coming rise in demand for lithium due to both the

coming environmental "green wave" as well as the anticipated substantial, rapid growth in demand for electric vehicles. A recent article suggests that conditions in the lithium market may not be quite as rosy as had been anticipated.

One thing is now certain. The markets are watching the news and are beginning to frequently react violently. Please note on the three-month chart of the Dow Industrials that during that time frame, there were no less than 15 days when the Dow traded through a daily range of 800 points or more, which I believe cannot help but add new increments of uncertainty to the investment community.

While most of the economic releases during the past month continued leaning toward the negative, there was one positive jolt. On the first Friday of June, the Department of Labor

released the stunning information that the economy had attained a net gain of 2.5 million jobs in May in contrast to the widespread expectation of losses amounting to about 8 million jobs. Optimists jumped on that figure and used it to issue forecasts that the recovery from the pandemic would be swift and powerful as illustrated by the strong gain in the Dow from 25,800 to 27,600 in the three trading days following the release of the report. It is also worth noting that apparently the American public took the good jobs report to heart as there was a sharp improvement in the University of Michigan index of Consumer Sentiment during early June.

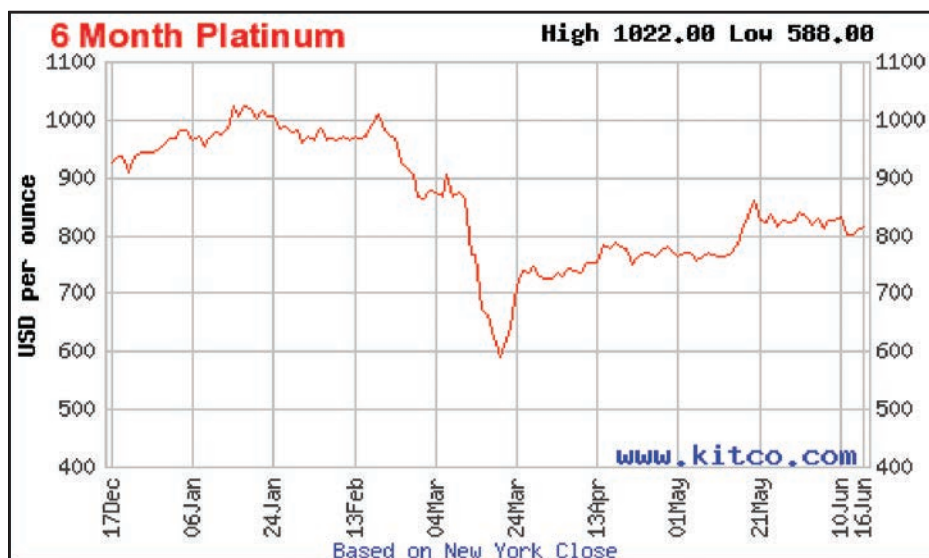
Among the negative items of economic data we would note a stunning drop in US Home sales, 2.4 million additional Unemployment Claims and a sharp decline in Industrial Production in America during April. Both interest rates and the official rate of inflation remained basically unchanged last month.

Despite the seeming craziness of the news background, both gold and silver turned in lackluster performances last month with gold trading in a general range of \$1,700—1,750 and silver closed close to unchanged near \$17.50. However, most shares on our Mining Stock Quotes lists outperformed the metals with "plus signs" predominating.

In late May a video emerged which has, quite literally, transformed America, at least for the time being.

DJIA—DOW JONES INDUSTRIAL AVG., 1 YEAR





The video showed how a black man, George Floyd, died in Minneapolis, Minnesota, at the hands of a white policeman while he had the police officer's knee on his neck for almost nine minutes. The video also showed three other officers witnessed the event but did nothing to stop its progress. The reaction to that video has bordered on the unbelievable.

First, rioting broke out in many parts of America with cars being burned, retail buildings having display windows shattered and widespread looting occurring. Then, because the victim was a black man who died at the hands of a white police officer, cries of racism led to huge public demonstrations, some peaceful and some not. Then we heard cries that because of this manner of police-led "systemic" racism, police departments should be defunded and even dismantled.

Two columns by opposing journalists illustrate the depth of the contrary positions. Writing in the *New York Times*, Charles M. Blow declared, "...Allies of all races have come to the black people's side, shocked by the continuation of the cruelty... This moment is enormous, packed with potential and possibility... The rage is real. It is urgent. It is fresh."

On the other side, in an article entitled "The Myth of Systemic Police racism," Heather MacDonald wrote in the *Wall Street Journal*, "This charge of systemic police bias was wrong during the Obama years and remains so today. However sickening the video of Floyd's arrest, it isn't representative of the 375 million annual contacts that police have with civilians."

There have been two recent developments. In one, the organization "Black Lives Matter" (BLM) has been growing by leaps and bounds, their spread being aided by social media and many major media outlets, and that growth has empowered them to make ever-larger and more intrusive demands, backed up by growing political influence.

In the other, a group of demonstrators have taken control of a six-square-block area of downtown Seattle and have proclaimed the independent nation of "CHAZ" or "Capitol Hill Autonomous Zone" and one of their first demands is the abolition of police forces in their new "nation."

MINING STOCK QUOTES

AKP EAJ CMS WPI BCN UVR ABI VRC AKP EAJ CMS WPI
20:30 4:7 6:22 7:2 45:7 9:30 78: 4:5 20:30 4:7 6:22

TORONTO Stock Exchange

STOCK	CLOSE	NET	CHANGE
Alamos Gold (AGL.TO)	10.58	-	.38
Alio Gold (ALO.TO)	1.26	+	.15
Americas Silver (USA.TO)	3.10	+	.15
Argonaut Gold (AR.TO)	1.89	+	.18
B2 Gold (BTO.TO)	6.97	-	.29
Caledonia Mining (CAL.TO)	22.35	+	4.24
Capstone Mining (CS.TO)	.76	+	.27
Centerra Gold (CG.TO)	13.06	+	.70
Copper Mountain (CUM.TO)	.56	+	.09
Eastmain Resources (ER.TO)	.11	n/c	
Endeavour Mining (EDV.TO)	30.86	+	2.52
Endeavour Silver (EDR.TO)	2.64	+	.66
First Majestic (FR.TO)	12.59	+	1.80
First Quantum Mines (FM.TO)	8.79	+	.78
Freegold Ventures (FVL.TO)	.54	+	.19
Gabriel Resources (GBU.TO)	.48	+	.03
Galiano Gold (GAU.TO)	1.57	-	.03
Golden Minerals (AUM.TO)	.48	+	.15
Great Panther (GPR.TO)	.57	-	.12
Golden Star (GSC.TO)	3.42	-	.08
Gran Columbia Gold (GCM.TO)	5.85	n/c	
Guyana Goldfields (GUY.TO)	1.76	+	.89
IAMGOLD (IMG.TO)	4.69	-	.37
Imperial Metals (III.TO)	1.81	+	.10
Kinross (K.TO)	8.43	+	1.28
Kirkland Lake (KL.TO)	49.84	-	5.20
Liberty Gold (LGO.TO)	1.31	+	.09
MAG Silver (MAG.TO)	16.31	+	.27
Marathon Gold (MOZ.TO)	1.58	+	.01
Nighthawk Gold (NHK.TO)	1.65	+	.19
NioCorp Dev. (NB.TO)	.71	+	.01
NorZinc (NZC.TO)	.06	n/c	
NovaGold Resources (NG.TO)	11.42	-	4.16
Oceano Gold (OGC.TO)	2.89	+	.38
Polymet Mining (POM.TO)	.45	+	.08
Pretium Resources (PVG.TO)	11.11	-	.56
Roxgold (ROXG.TO)	1.25	+	.01
Sabina Gold & Silver (SBB.TO)	1.71	+	.51
Seabridge Gold (SEA.TO)	20.49	+	.25
Semafo (SMF.TO)	4.30	+	.32
Silver Bull (SVB.TO)	.10	+	.01
Silvercorp Metals (SVM.TO)	6.70	+	.99
SSR Mining (SSRM.TO)	25.13	-	.19
Teck Resources (TECK)	15.90	+	1.10
Torex Gold (TXG.TO)	16.93	-	.76
Treasury Metals (TML.TO)	.41	+	.14
Trevali Mining (TY.TO)	.10	+	.02
Turquoise Hill Res (TRQ.TO)	.91	+	.26
Yamana Resources (YRI.TO)	6.64	-	.54
Yangarra Resources (YGR.TO)	.68	+	.28

CANADIAN Stock Exchange

STOCK	CLOSE	NET	CHANGE
Angkor Gold (ANK.V)	.06	-	.01
Arena Minerals (AN.V)	.03	n/c	
Avalon Ventures (AVL.V)	.06	n/c	
Bear Creek Mining (BCM.V)	2.30	+	.33
Canalaska Ventures (CVV.V)	.15	-	.01
Canada Cobalt Works (CSR.V)	.52	+	.06
Commerce Res. (CCE.V)	.20	+	.01
Copper Fox (CUU.V)	.10	+	.03
Equinox Gold (EQX.V)	13.54	+	1.75
Firefox Gold (FFOX.V)	.11	+	.02
Frontier Lithium (FL.V)	.21	+	.04
GFG Resources (GFG.V)	.25	+	.04
Gold Standard Vent. (GSV.V)	.90	-	.02
Goldsource Mines (GXS.V)	.13	n/c	
Guyana Goldstrike (GYA.V)	.05	+	.02
Largo Resources (LGO.V)	.94	-	.07
Maya Gold & Silver (MYA)	1.97	+	.65
Noront Res. (NOT.V)	.17	+	.05
Sandstorm Gold (SSL.V)	10.98	-	.10
Skeena Res Ltd (SKE.V)	1.36	+	.29
Triumph Gold (TIG.V)	.21	+	.02
Victoria Gold (VIT.V)	12.44	+	1.38
Wallbridge (WM.V)	1.19	+	.19
White Gold (WGO.V)	.90	+	.24
Zimtu Capital (zc.v)	.11	+	.02

GOLD IN FOREIGN CURRENCIES

Canadian Dollar	2,354
Japanese Yen	185,691
Swiss Francs	1,647
British Pound	1,381
EC Euro	1,540

MINERAL & METAL PRICES

ALUMINUM/pound, London	\$.71	PLATINUM/troy oz.	\$820
COPPER/lb, NY spot	\$2.67	RHODIUM/troy oz., London	\$6,000
GOLD/oz, New York spot	\$1,767.90	SILVER/NY spot, troy oz.	\$17.97
LEAD/lb, cash	\$.79	U ₃ O ₈ /spot, lb	\$32.85
NICKEL/lb, cash	\$5.74	ZINC/lb	\$.92
PALLADIUM/troy oz.	\$1,861		

AMERICAN Stock Exchange

STOCK	CLOSE	NET	CHANGE
Eldorado Gold (EGO)	8.33	-	.39
Gold Miners ETF (GDX)	32.64	-	1.44
Gold Reserve (GRZ)	1.70	+	.14
iShares Silver ETF (SLV)	16.28	+	1.73
Taseko (TGB)	.48	+	.15

NEW YORK Stock Exchange

STOCK	CLOSE	NET	CHANGE
Agnico Eagle (AEM)	59.25	-	5.70
Anglo Gold (AU)	24.34	-	.64
ASA (ASA)	15.21	+	.82
Barrick Gold (ABX)	24.39	+	1.74
Couer d'Alene (CDE)	4.92	+	.95
CVRD (Brazil) (VALE)	10.63	+	2.45
Freeport McMoRan (FCX)	10.49	+	2.09
Hecla (HL)	3.10	+	.53
Lithium Americas (LAC)	4.15	+	1.02
McEwen Mining (MUX)	.91	+	.03
Newmont Mining (NEM)	55.45	-	8.44
Streettracks ETF (GLD)	162.62	+	1.04

SOUTH AFRICAN MINES

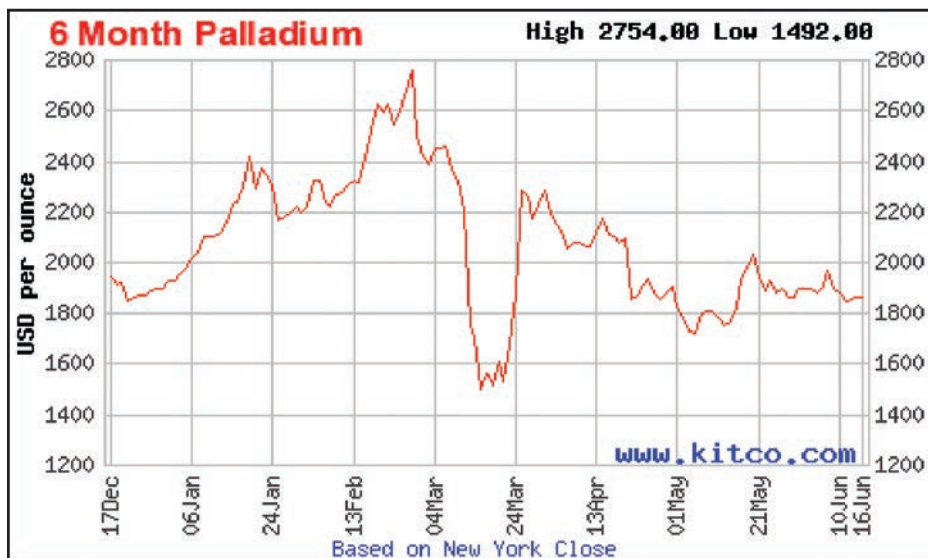
STOCK	CLOSE	NET	CHANGE
Gold Fields (GFI)	7.48	-	.60
Harmony Gold (HMY)	3.14	-	.38

NASDAQ Over-the-Counter

STOCK	CLOSE	NET	CHANGE
Gold Res Corp. (GORO)	3.84	+	.09
Pan Amer. Silver (PAAS)	26.14	+	4.54
Royal Gold (RGLD)	120.35	-	7.84

Selected mining stock quotes as of June 12, 2020. They are offered **only** as a point of reference.
Amount of change is indicated month to month. Mineral & Metal Prices as of June 22, 2020.

Gold/Silver Share Index: 1114.48 **Dow/Gold Ratio—DJIA:** 25,605 **Gold:** 1,737.30 **Ratio:** 14.74 **Copper:** 261.55
30-Year Bond Rate: 1.450 **Nikkei Index:** 22,305 **US Dollar Index:** 95.95



It is clear the magnitude of these upheavals may be unparalleled in American history and it is too early to predict their ultimate outcome. But one thing is certain for the precious metals—these events reflect growing instability—and growing instability has historically been positive for the prices of gold and silver.

The Covid-19 pandemic has hardly disappeared from public attention and, in fact, the powerful economic consequences continue to occur. As an important example, the entire Canadian West Coast cruise ship season has been cancelled through the end of October, functionally meaning the entire season. In Victoria, BC, their newspaper, the *Times Colonist*, noted “The cruise-ship season that was forecast to bring more

than three quarters of a million passengers to Victoria’s shores—and an estimated C\$130 million in economic activity—has been scuttled. Everyone from street vendors to restaurants, retailers, transportation companies and suppliers is expected to feel the blow.”

Southward in Seattle, Boeing Co. said it was eliminating 12,000 US jobs as the largest American plane maker restructures in the face of the coronavirus pandemic. Boeing also disclosed it planned several thousand additional layoffs in the next few months. The number of people who have lost their jobs now numbers nearly 40,000,000 and many now doubt whether a strong and rapid recovery will take place. As long as government measures to restrict economic activity remain in place, we may well observe a growing move-

ment to rebel against the harshest of such measures.

Among such “rebellious” measures, attendance at beaches and parks is growing and, as noted above, participation in political rallies is exploding, leading to massive gatherings, ignoring “personal distancing” regulations as well as limitations on the size of gatherings. In fact, many would suggest that a sense of anger against government regulations may be in the air.

Once again, history would suggest growing instability may be a genuine threat—which, by historic observation, could lead to higher prices for gold and silver.

As previously noted, the damage already caused by the pandemic has been enormous but one additional area deserves special attention. As we have warned for several years, many pension plans are now at serious risk.

For several decades, the pension industry relied on high interest rates to generate income on stored monetary wealth, and it was this interest income that was vital to their ability to meet pension payment requirements. However, during the past two or three years, many interest rates have actually approached zero. This has required pension companies to seek higher returns elsewhere, including some stock market investments where the level of risk is higher.

All worked well as markets rose steadily, but the pandemic put a serious dent in that strategy when markets plunged as the pandemic developed (see S&P 500 chart), falling by as much as 35%, thereby putting a severe dent in the ability of pension companies to meet their obligations. Now, many state pension plan administrators are crying out for help from Washington to bail them out—and the same concept holds true for many private pension plan corporations as well.

Problems are not likely to disappear quickly as many analysts from both the Left and the Right predict a long road back before sustainable prosperity is achieved. An article in the *Wall Street Journal* described the growing gloom thusly: “...Lockdowns were first billed as short-lived... but since then sev-

SPX—S&P 500, 1 YEAR



eral national retailers have filed for bankruptcy protection. J.C. Penney Co., which closed its stores on a temporary basis in March, said it will permanently close 240 locations, or nearly 30% of stores. Pier 1 Imports reversed a plan to re-open some stores by June 1, instead closing stores for good. Goodyear Tire & Rubber Co. recently said it would

All of the above leads to perhaps the most important question for the precious metals, which is, "Can all of this stimulation be continued without re-igniting the fires of inflation?"

Noted economist Paul Kiernan published a study in mid-June that showed how dire the situation has become. By May, the fiscal year deficit already stood at \$1.88 trillion,

the money supply has risen at an annual rate of 102% and the excess reserves of the banking system have doubled."

Investment advisor and author Arkadiusz Sieron, after similarly documenting the sudden escalating growth in bank credit and M2 money supply, concludes, "This crisis is more likely to result in stagflation"

By May, the fiscal year deficit already stood at \$1.88 trillion, the largest on record. Revenues were collapsing while outlays were soaring. Historic records for both debt and deficits are not merely being broken; they are being obliterated.

close an Alabama plant after temporarily suspending operations there and at other US factories in March."

How then is the government planning to come to the aid of the economy? Well, it appears that stimulation in the form of additional relief packages is being actively promoted in the halls of Congress, even after about \$4 trillion has already been approved, which has resulted in estimates that the budgetary deficit for 2020 will come in near \$4 trillion and the National Debt may soar to as high as \$30 trillion by the end of this fiscal year.

The obvious question is just how much of this kind of debt and deficit growth can the nation afford?

the largest on record. Revenues were collapsing while outlays were soaring. Historic records for both debt and deficits are not merely being broken; they are being obliterated. Even Treasury Secretary Mnuchin predicted that there was a strong likelihood that America would need another stimulus package.

And yet, to date there has been no resurgence of inflation. However, there are those economists who are now willing to stick their necks out and declare "this time may be different." In a *WSJ* article, former presidential candidate Phil Gramm points out that this time around we are now seeing rapid expansion of the nation's money supply, something missing since the "Great Recession." Gramm notes that, "... In the past two months,

(simultaneous growth in inflation accompanied by economic stagnation) and then offered this welcome conclusion, "...the higher odds of inflation are fundamentally positive for gold prices."

I happen to agree.

The lithium article referred to earlier was published by Reuters and is headlined, "Lithium producers must wait as pandemic slows electric vehicle revolution," and also informs us that "The coronavirus pandemic has paused the electric vehicle revolution, forcing producers of battery metal lithium into survival mode..."

Few stories have captured the imagination of the mining investment community during the past several years as the tale of lithium's relentless growth in demand which was to have taken place thanks to predictions of astonishing growth in lithium-ion battery usage based on the "assured" growth in electric car demand. Many stocks exploded upward in price, but then crashed when the demand failed to materialize and we offer the chart of one of the stocks on our lists, Frontier Lithium, as an example of this "round trip" ride.

(Please note that no investment advice is either offered or suggested. Investment decisions should be made only after consultation with registered investment advisors.)

CA:FL—FRONTIER LITHIUM, 5 YEARS

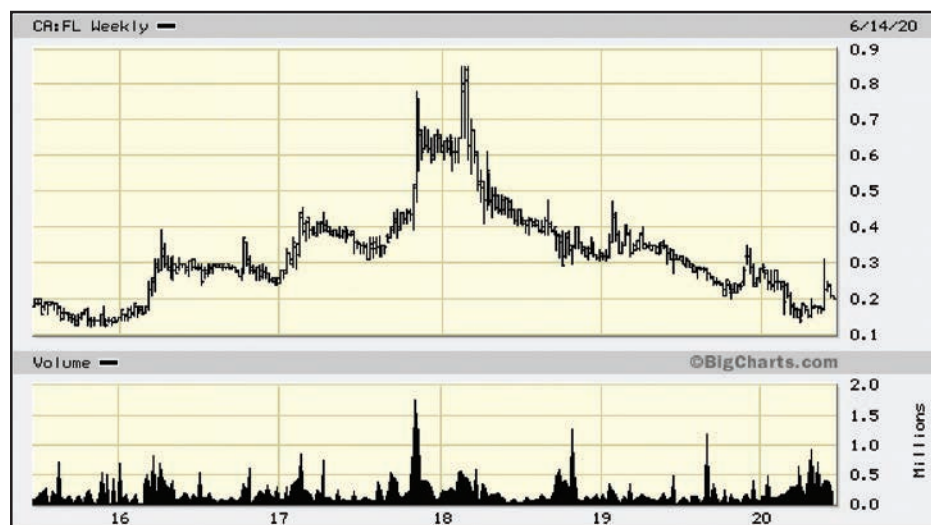


Chart Analysis— Copper, 8 Years

Few important commodity materials appear to reflect worldwide economic activity as our friend, “Dr. Copper.” This is true because the uses for copper (CU) and its widespread demand are universally recognized in international economic analysis.

Among the multitude of uses for CU we find electrical wiring, state-of-the-art cookware, plumbing, solar panels, motors of all sorts including power plants for electrical automobiles, microwave ovens and other household appliances, medical applications, and even the “brass” sections of orchestras where CU is an essential alloy ingredient for horns, saxophones and trumpets/coronets—among many others.

It is this astonishing number of applications that gives CU a primary role in fundamental economic analysis—and which makes evaluating the red metal’s charts an important

part of our overall analyses—and it is worth noting that Dr. Copper has performed this duty exceptionally well during the coronavirus pandemic.

During the economic growth brought about by the recovery from the “Great Recession” of 2007-09, CU rallied to a peak (P) near \$4.60 per pound in mid-2011, which was then followed by a steep decline to \$3.00 before year-end 2011. The chart then traded within a narrowing triangle (dotted lines) which broke to the downside before trading under a declining trendline (dashed line) which carried CU down to a major low (L) in early 2016 near \$2.00/lb.

CU then rallied, breaking out above that declining trendline and eventually forming a bullish “upslanting right-angle triangle” (solid lines), and the upside breakout from that pattern carried CU to its highest peak (P2) since the low of 2016. The chart then formed a clear “head and shoulders top” (LS, H (at

P2), RS) with a neckline (dotted line) near \$2.50/lb.

The break to the downside below this neckline coincided perfectly with the advent of the arrival of the coronavirus pandemic and the economic fears it inspired. CU plunged rapidly to a secondary low (L2) just above \$2.10 when fears of an economic catastrophe abated and CU rallied sharply back to the range of \$2.50 to \$2.70.

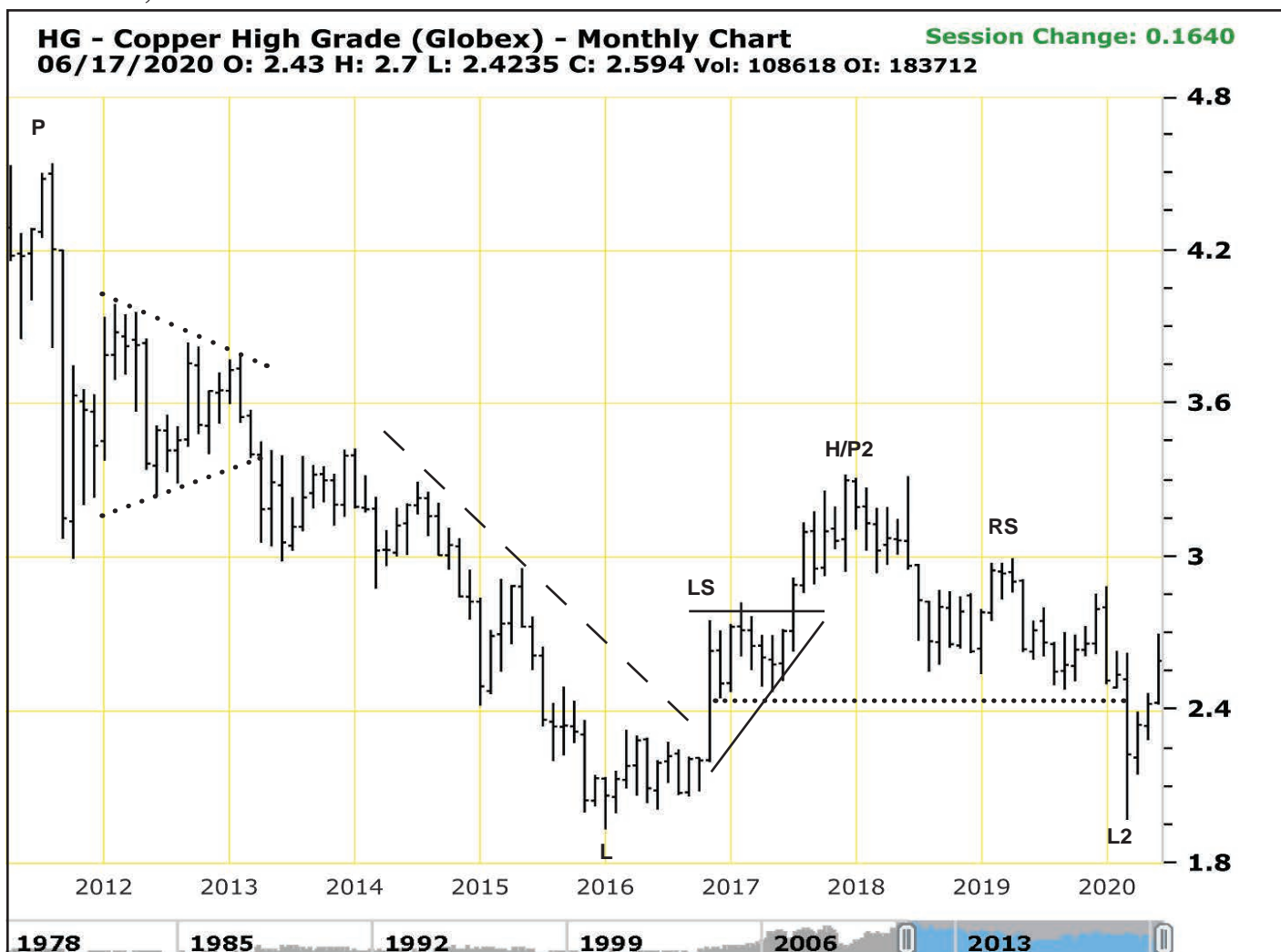
Given its past excellent reliability as an economic indicator, we will continue to closely follow movements in the CU chart and report regularly.

Our “World of Gold” indicators are as follows:

(Note: A “Positive” rating means the situation is beneficial for precious metal prices.)

INFLATION—Changes to NEUTRAL. Based on the rapid recent

COPPER, 1 YEAR



TYX—30-YEAR TREASURY BOND INDEX, 2 YEARS



growth in America's monetary aggregates, we now believe the seeds have been sown for accelerating future growth in the rate of visible price inflation.

INTEREST RATES—Remains **NEGATIVE**. Short-term rates remain close to “zero” while long-term rates (see TYX chart) are holding at just over 1.4%. No substantial change is anticipated in the near future.

INTERNATIONAL TEMPERATURE—Remains **POSITIVE**. Massive street demonstrations related to racial upheavals have now been added to the already-long list of international problems already threatening world peace.

US DOLLAR INDEX—Remains **NEUTRAL**. This once-volatile indicator continues to trade within a narrow range (see chart) with no current indication of any important change in direction.

US POLITICAL TEMPERATURE—Remains **POSITIVE**. With elections drawing nearer, rioting and demonstrations in the streets, increasing hostility to the President and even calls for the defunding of police forces, it is difficult to imagine a more volatile political situation than the one faced by America at present.

US ECONOMIC TEMPERATURE—Remains **POSITIVE**. As noted above, many of the economic

decisions taken during the past two months appear destined to re-stoke the fires of future inflation.

WORLD'S STOCK MARKETS

—Changes to **NEUTRAL**. Recovery rallies during April-June have brought many indexes around the world back to near the middle of their trading ranges.

GOLD'S TECHNICAL POSITION

—Remains **POSITIVE**. Gold has now remained just below its seven-year high and all three trends remain bullish. A breakout above \$1,800 would be a bullish indicator.

TOTAL SCORE; Positive, 4, Negative, 1, Neutral, 3.

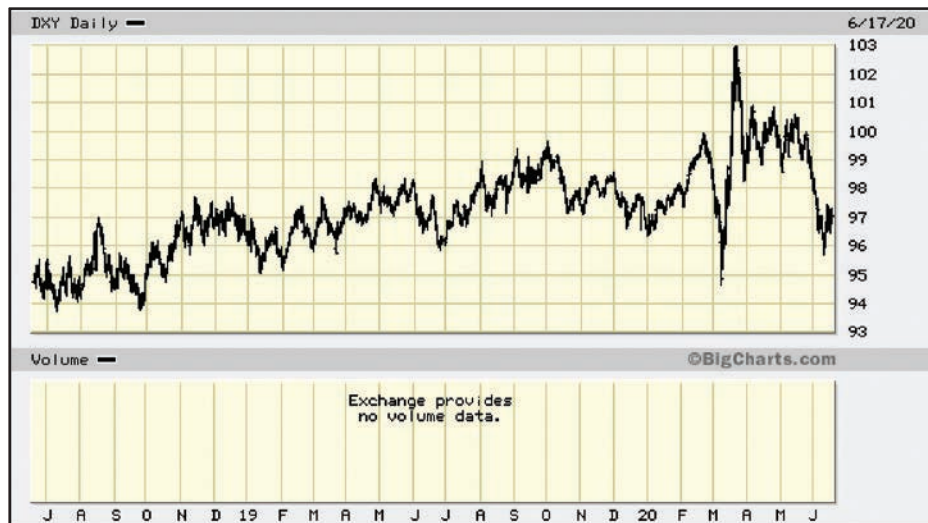
Final Thoughts:

One of the possible results that might occur due the changing political scene is that we may be headed for serious debate regarding a concept that was once relegated to the fringes of economic and social conversation. I am referring to the subject of “Reparations for American Slavery” and the amounts of money being bandied about could truly threaten the stability of the entire US Government and, indirectly positively impact our world of gold and silver. The *Wall Street Journal* just published a serious study on the subject and I plan to discuss this matter next month.

Until then, enjoy the great outdoors and Happy Prospecting!



DXY—US DOLLAR INDEX, 2 YEARS



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NAA, Fire, Chemical assays showing Au, Ag, Pt, Cu, Ti, W, and rare earth. Hot spots running 1 oz/yd. Au. Hard rock potential with 1.5 oz/ton Au. Near Dolan Springs, AZ. (702)876-3907 or plroberts1@aol.com

RMaytf

34 STATE MINING CLAIMS OUT OF NOME, AK

By pioneer mining family. Includes 2 adjacent creeks with mostly virgin shallow ground. Old bucket line dredge on one. Both with mining history from Gold Rush to 1950. For sale or lease to qualified miner. Contact JIM. Ph: (907)304-1756 or email: eaglejim39@yahoo.com HMar7f

HISTORIC MUD CREEK PLACER MINE

FEATURED IN *ICMJ* IN MARCH 2003
<https://www.icmj.com/magazine/article/mud-creek-placer-mine-adventure-1614/>
A WORLD-CLASS POTENTIAL PLACER GOLD DEPOSIT backed by authentic, verifiable, geological reports showing **73,000 PROVEN**, mineable ounces of gold reserves and with the **POTENTIAL** reserves evaluated at **2.8 MILLION OUNCES** of recoverable gold in the over 2,000-acre AK state claim block, located 140 air miles NE of Nome, at Candle, AK. Offering significant ROI for seed capital, lease, with advance on royalties, joint venture or outright sale. \$3,285,000. Principles only please. kingfish@consultant.com

EFebtf

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WJun3f

GOLDFIELD, NEVADA MINING CLAIMS FOR SALE

Approximately 360 acres of Placer mining claims (2-160 acre claims) for sale just a few miles from Goldfield, Nevada. Average value from many assays over the past 15 years is +.12 ounce gold per ton, also tellurides on the property. Asking \$250,000 terms available or trade for Fee Simple property, equipment, motorhome, ore concentrates, etc. Reply to uniongulf7@gmail.com for information and location. UNION GULF RESOURCES, CORP. (619)609-0234. KJun3f

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4 PLACER CLAIMS JUST SOUTH of
Rich Hill, AZ. Nice gold & nuggets. \$28K
mike.rob1@att.net (432)559-7421.

RMartf

882 ACRES FEE SIMPLE with PATENTED CLAIMS

Alaska, 41 Parcels—\$1,400,000

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(907)562-3382 Text/Voice

EJuntf

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and other equipment needed for small placer gold project on private property in N. Nevada. Generous split on tested and recently proven deposit. (775)544-8494. BJun3f

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ALASKA FORTY MILE RIVER NORTH FORK CLAIMS

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WHY BUY A CLAIM

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GFebtf

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SMaytf

(2) 40-AC ADJOINING PARCELS

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CMay3

**HISTORIC EUREKA CONSOLIDATED
PATENTED PLACER CLAIM**

Consists of the Eureka & Donaldson Placer claims, located in eastern Oregon. Consists of approx. 30 patented acres. Cracker Creek runs through the entire length of the property. 4,500 yds washed to date with 34 oz. of gold recovered. An estimated 1.3 mil yards of pay available to be mined. Owners are looking to sell the full operation (land and equipment) or possible royalty lease option. Contact RUSS (701)580-1554. Serious inquiries only please.

BApr6

MINING CLAIM FOR SALE

Southwestern OR—\$400,000. 3/4 sq. mi.—(475 acres) under Placer Claim. 20 acres under Lode Claim. 6 major en echelon quartz fissures. Excellent production history. 3 established lode mines with free-milling ore (that we've located). Some ore out of 2nd level mine over 100 OPT in some bodies. One known pocket extraction in order of 90 lbs. in 1905. 1/4 mi. of premier mining creek access. 1,200 sq. ft. (approx.) house with open well. 3-level mill building w/ore hopper. Closed circuit pilot mill—4 tons per day. Electric line power onto property. Claim in moderate, mixed conifer timber. 1/4 mile from paved road. 12 miles from services on paved highway. Contact: BILL 19rufus82@gmail.com PAprtf

**FOR SALE OR LEASE TO QUALIFIED
OPERATOR—LARGE,
WORLD-CLASS PLACER & LODGE
MINING PROPERTY**

Approx. 15 million tons of pay. Located in BC, Canada, Cariboo region. Runs 2 grams per ton fine, free gold at surface. The first cut is approx. 45,000 sq. meters. Holding approx. 300,000 tons. Showing 5 grams per ton. A fault line on this property runs the full width of this deposit, directly above this deposit with a large exposed boron structure, holding Au, Ag, base metals and rare earths. (Ministry of Mines ordered statement). This property is offered for mining purposes only. Ownership of the title to it does not include ownership of the surface rights or the rights to use the surface for residential or recreational purposes. olivierpaulette@yahoo.ca

OJul3

ALASKA GOLD PROPERTY

For Sale—Crescent Creek Cooper Landing, AK. Federal claims, 22 years continuous title. (3) 20-acre claims, coarse gold to 1/2 oz. virgin ground. Too old to work claims. \$40,000. (2) Denver mechanical panners. Contact for info. JOE DEMAREE, (907)398-7807.

DFeb12

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VAugtf

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HNovtf

KINGS CANYON HISTORICAL MINES, Colorado, near Walden. Two registered mines —20 ac. Placer Claim; 20 ac. Lode. Search YouTube for "Kings Canyon Historical Mine." Make an offer. Handymandem@hotmail.com, (818)261-9512. MJantf

JV PARTNER SOUGHT FOR QUALITY Arizona placer mine. Extensive testing including pilot plant operation. 43-101 compliant report. 705,800 oz. AU. Average ore tenor 0.055. 332 total acres. Permit for 80 acres with projected 5-10 oz. per day operation near completion, expected September 2019. Some equipment on site. Seeking capital for MSI turnkey 200 yph system. omnimetal@outlook.com

PAugtf

**EXCEPTIONAL CLAIM
NORTHERN CALIFORNIA**

20-acre mining claim with 1320 feet of large historic gold creek flowing through. 4WD access and two good camp sites on claim. Creek is known for nuggets and there is an old placer mine above the creek. Come check it out yourself. \$4,500. (541)507-7265.

YApr4

**UPDATE! PINAL CO., AZ—3.5 SQ MI
BLM AU & AG PLACER CLAIMS!**

Some of the largest mines in America are in Pinal County, AZ!! Preliminary Estimates: \$35,294,830,144, surface to 100' precious metals per square mile! Easy access level placer claims. Solid geology reports audited by a professional independent third-party geology doctorate expert! Preliminary discovery tests on approximately 12 acres show about \$40 million in gold and precious metals from the surface to only 6 feet deep! RECENT one mile to the south 2nd test of 70 acres reports even higher results! Maps and assays in the reports indicate potentially massive reserves. Broad geo formation indicates possible total site mineralization all the way into the adjoining sites. Professional geology reports available online! In addition, depending on the qualifications of the buyer, seller will consider holding 50% of the \$6,000,000 as a seller carry loan at 5% for 5 years interest only with a 5% NSR. Price: \$6,000,000. edsmith11@msn.com

SApr7

Three PATENTED Gold Claims 47 acres, Randsburg, California. Owner will carry. Get details <http://openpoll.com/gold>, email: davidtreadwell@verizon.net or call (951)288-9075. TJJan12

NEVADA ALLUVIUM GOLD PLACER 22 Million++ yds³ \$54.67/yd³ gross. Bulk sample tested to false bedrock. (775)781-3906. MAprtf

ALASKA—GOLD CREEK near Valdez Creek off of the Denali Hwy. 600+ acres. Shallow bedrock. Motivated seller. Financing available. \$45K OBO. (907)768-1137, alaskarangemining@hotmail.com

WMartf

OPAL MINING CLAIMS FOR SALE

Bordered next to the famous patented Royal Peacock Opal Mines. The Royal Peacock Opal Mines have produced millions of dollars in opal for the past century. Two 20-acre mining claims, and two 5-acre mill sites. One claim is within 20' of where they are producing opals on the Famous Northern Lights patented mining claim. Price is \$150,000.00 for all. Contact: WALTER WILSON by email at walter_wilson2003@yahoo.com

WApr6

ALASKA FORTY-MILE RIVER MOSQUITO FORK CLAIMS

4 contiguous state river bottom dredging claims (1 mile) on the Mosquito Fork of the Fortymile River adjoining the producing Mosquito Fork Placer Mine. Road access. \$2,500 per claim or \$8K for all. Send email. chickengoldcamp@gmail.com

BApr3

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aLJultf

4 PLACER CLAIMS JUST SOUTH of Rich Hill, AZ. Nice gold & nuggets. \$32K mike.rob1@att.net (432)559-7421.

RSeptf

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RJul1

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VJul1

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MJan6

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