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Gold from Water (And Other Mining Scams)

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Investors lose $2 billion as mining-stock price plummets on news that Indonesian gold ore contains no gold! The Canadian mining company Bre-X successfully attracted a range of investors, from unsophisticated individuals to savvy mining professionals, to invest in its Busang gold prospect, claimed to be the largest discovery of gold in history. After years of successful promotion, the truth about this worthless property slowly emerged early in 1997 and drove Bre-X stock prices nearly to zero. The boldness, sophistication, and magnitude of this scam is almost unbelievable, dramatically eclipsing previous schemes like this. It is the largest case on record, but only one of many such mining scams, both large and small, apparently unintentional or boldly deceitful, perpetrated on investors over the centuries.

Mining, when entered by a novice, can be a dangerous place to invest one's money. Mark Twain said, "A mine is a hole in the ground owned by liars." Mark Twain spent a number of years on the Comstock lode in Virginia City, Nevada, and through repeated experience, knew what he was talking about. Mining is a thoroughly respectable business, but the unwary investor can be duped by con artists.

Having worked as an analytical geochemist for many years I have been confronted with many scams and many confused prospectors. Analytical geochemists are professionals who, after many years of college and two or three degrees in chemistry, geology, or the hybrid, geochemistry, are skilled at determining the concentrations of elements (such as gold, silver, platinum, and copper) in rocks, minerals, soils, sediments, water, and vegetation. These natural materials are complex, containing at least trace amounts of all of the naturally occurring elements on the periodic chart from hydrogen (atomic number 1) through uranium (atomic number 92), except for technetium (number 43, which has not been found to occur naturally) and promethium (number 61, another short-lived radioactive element not found naturally). The complexity of these natural materials makes their analysis a difficult task, requiring extensive knowledge, experience, and expensive instrumentation.

I have been exposed to many varieties of mining scams and have tried to help people whose limited knowledge has gotten them in over their heads in one situation or another. That people might pursue prospecting or investing in mining projects comes, I think, from the perception that, with little financial investment and/or only very basic knowledge, one can successfully find a valuable mineral deposit just waiting for discovery. This is akin to a pot of gold at the end of the rainbow or finding a buried or sunken treasure. The problem, I have found, is that when exploring a new field of knowledge that is unfamiliar to us it is very difficult to know just how ignorant we are. We can read

books, magazines, and technical papers and feel that we have learned a tremendous amo unt and feel very knowledgeable about the subject. The problem is that we don't really know whethe r we now have a command of the subject or whether we have not even scratched the surface. This is one very valuable feature of obtaining a formal education or even taking a class in a subject given by a specialist in the field: the professor or specialist knows the breadth and depth of t he field and can answer this question for you.

I have observed that there are several types of people who become involved in mining imbroglios or promotions:

- The classic con artist who intentionally tries to sell a worthless mining property or ineffective machine or technology for extracting valuable metals from a deposit that cannot be ot herwise worked at a profit.
- The prospector with marginal knowledge who inadvertently promotes a worthless propert y or process on friends, family, other investors, or himself, because he knows no better.
- The devious small laboratory owner , generally in a rural location, who intentionally reports high concentrations of valuable metals in almost every sample he analyzes to encourag e customers to continue prospecting, sampling, and developing properties. In this way h e guarantees himself more business as customers extend their sampling and chase their t ails trying to outline a rich mineral deposit that is not there.
- The incompetent assayer or self-taught, but incompetent, extractive metallurgist who inadvertently causes others to develop a worthless property or process through errone ous analytical results. This he does out of incompetence, not malice, but the end results are the same disastrous ones.

Some people possess a natural savvy or personal cautiousness that leads them to seek a second opinion from a professional specialist before being drawn into a promotion or misguid ed project. I have met more people, however, who are already in trouble (financially and/or legally) when they come seeking professional, unbiased help. In either case, the victim wants to believe the incompetent or devious promoter rather than believe me when I generally have to tell them that th ere is no value in the property or process that they are pursuing. Or they are reluctant to accept th e truth when I have to point out that they have brought me a sample containing a significant amount of gold, for instance, but that the small vein from which it came does not contain enough tonnage of this same material to constitute a valuable ore deposit, and it would cost more to mine and pro cess the vein material than there is value of gold present in the vein.

But this, I have come to understand, is reasonable because the victim wants to believ e that there are riches to be had from the project in which they have become involved. The alternative is to believe me when I have to tell them that they have wasted their money and/or have inadvertent ly led others to throw their money into a worthless project.

Often, there is some aspect of the project that does not seem quite right or consiste nt, however, which is the reason that they have come seeking another opinion. This is often the point wh ere a misguided or promoted extraction technique has been financed and a mill built, only to find tha t there are "low-recovery" problems with the mill. In actuality, there is generally no precious metal in the "ore" to be recovered. Once I show them how to use scientific methods to control the number of va riables that they are dealing with, to assess whether their rocks are ore or not, they reluctantly take my advice, agreeing that my careful, stepwise assessment has led to the unambiguous conclusion t hat the project is worthless.

Other people, however, come with samples several times before they are persuaded to c ut their losses and abandon the project. And then there are those who simply get angry and accuse me of close-mindedness and of being unwilling to consider anything new. I am really not, however, and have often followed others' "menus" under controlled conditions in our clean laboratories, to assess special assaying or extraction protocols that are said to release or liberate the gold in a s ample that otherwise would report nothing when assayed. Without exception this has convincingly and unambi guously demonstrated that the "special" protocols or treatments are useless.

There are many varieties of scams and many claims, for one reason or another, that ce rtain ores cannot be assayed by conventional methods. The story generally goes that the material s contain fabulous, ore- grade concentrations of precious metals but some peculiarity of the or e causes conventional assaying methods to fail to record their presence. Not only is the ore v ery high grade, there are tremendous quantities of it that will yield millions or billions of dollars in riches when using the new methods of assaying and/or extraction. Many of these scams and claims are rec urring and one must have patience to deal with them over and over again. The types of scams will be reviewed below and the claims of unassayable ores will be explained and dismantled.

This problem of promoting worthless properties and procedures is a very old problem t hat is difficult to exterminate. People who become interested in investing in mining projects and look for tremendous returns by funding unusual new technologies or unusual new properties gene rally do not have the depth of knowledge required to properly assess these projects. Unless they r ealize this and hire an unbiased consultant to guide them, they are doomed to repeat this aspect of h istory. Mark Twain, in his book *Roughing It* , tells an interesting and not uncommon vignette:

"Assaying was a good business, and so some men engaged in it, occasionally, who were not strictly scientific and capable. One assayer got such rich results out of all specimens brough t to him that in time he acquired almost a monopoly of the business. But like all men who achieve succ ess, he became an object of envy and suspicion. The other assayers entered into a conspiracy against him, and let some prominent citizens into the secret in order to show that they meant fair ly.

"Then they broke a little fragment off a carpenter's grindstone and got a stranger to take it to the popular scientist and get it assayed. In the course of an hour the result came, where by it appeared that a ton of that rock would yield $1,284.40 in silver and $366.36 in gold!.... Due publi cation of the whole matter was made in the paper, and the popular assayer left town 'between two da ys'. "

Ore vs. Mineralization, a Fundamentally Critical Concept

The title of this publication suggests that one cannot obtain gold from water. This i s not entirely true. Water, like other natural substances, contains at least trace amounts of all of the [Image] elements found on Earth, including gold. The critical point is that, given current technology, one cannot extract gold profitably from seawater or most other water because the concentration of gold i s very small (it has been tried repeatedly, notably by the Germans during World War I to help fund the ir war machine, unsuccessfully, of course). Very large volumes of water would have to be pro cessed to recover a small amount of gold. It has always cost more to process the water than the value of gold in that water. The more water we process, the more money we lose. If we could find a res ervoir of water somewhere that, for some reason, had a much higher concentration of gold than normal, we could indeed make money by extracting gold from water (this is exactly what some promoters try to sell to unwitting investors). This is akin to the concept of an orebody (which can be profita bly worked) as

compared to mere mineralization (which cannot currently be worked profitably). Let's analyze this critical concept further.

Natural processes recurring over the history of the Earth have caused some minerals to become concentrated in extraordinary amounts in rocks in certain places. These areas of concentration of minerals are where we go to extract minerals at a profit. Finding areas of exceptional mineral concentration is the realm of prospecting or mineral exploration.

In order for the extraction of minerals to be profitable, the proper minerals generally must be:

- ***Highly concentrated by natural processes,***
- ***Located in rocks near the Earth's surface,***
- ***Located in an environmentally insensitive spot, with relatively easy access, with water available, power not too far away, inexpensive transportation available to ship the extracted minerals, in an area of hospitable climate, etc. This type of mineralization is referred to as an orebody because the minerals constituting ore can be processed and sold for a profit.***

The discrimination between mere mineralization and an orebody requires three-dimensional information about the volume of mineral-rich rock available for extraction. This requires drilling, tunneling, or trenching, combined with sampling the rocks and assaying them. This is the only way to determine how many tons of mineralized rock are present and what concentrations of the metals are present. After calculating the value of the minerals in the ground, we must determine the costs to extract a certain percentage of the minerals from the ore (it is generally not possible to extract 100% of the ore mineral). The value of the minerals in the ground minus the costs to extract the minerals, minus the up-front costs of prospecting and constructing and permitting the mine, minus the end costs to decommission the mine and reclaim the area, tells us how much net profit might be available to earn over the life of the mine. Only at this point can we rationally make a decision whether to pursue the project or investment. It can be very expensive to get to this decision point, and most individuals cannot afford to get there on their own.

Some Recurring Assaying Scams

The assaying scams are essentially? limited to the precious metals, largely gold, silver, platinum, and rhodium. There are reasons for this. Many elements are mined from the Earth, but only the very valuable elements (precious metals) can be profitably mined at very low concentrations in their ores (see the table below for relative values of precious metals and base metals). At these very low concentrations, the precious metals or minerals are generally very finely and widely dispersed throughout the rock. They are so finely dispersed that they are often difficult or impossible to see with conventional microscopes even when their concentrations are high enough to be mined profitably. This forces us to rely on the results of chemical assays to determine whether economic concentrations of these precious metals are present, without being able to verify their presence with a microscope. This is where the incompetent and the unscrupulous find fruitful ground to err, to misconstrue, and to deceive. These problems and scams do not arise with other metals because the erroneous or fraudulent assay results could quickly be verified or dismissed through microscopic examination of the ore by a competent mineralogist, either professional or amateur.

While the salting of samples (covertly adding a small amount of metal to a sample that a potential

investor would then have assayed) still occurs, it has not been tried on samples that I have received for verification assaying. It is not difficult to tell microscopically the difference between the manner in which nature and man normally add precious metals to rocks. Knowing this, Bre-X em ployees, in manipulating the apparent gold grades in drilling samples from the Busang prospect, b lended in small portions of very high-grade natural ore material from other properties with the Busan g samples. This made the Busang samples appear to be moderately mineralized with gold and effectively delayed the discovery of salting of the samples for years.

Approximate prices per pound of precious and base metals

Gold and Silver		**Platinum Group**		**Base Metals**	
Gold	$4,700	Platinum	$6,300	Copper	$1.00
Silver	60	Palladium	2,200	Lead	0.40
		Rhodium	3,900	Zinc	0.75
		Ruthenium	550		
		Osmium	4,000		
		Iridium	2,800		

Those prospectors who are on a really tight budget (and there are many) will often tr y to perform assays at home because they cannot afford the ten dollars or so that it costs to get a commercial assay done. When prospecting for precious metals, assays are necessary or one is limited to looking only for very high grade deposits in which the metals are visible. With home assays people gen erally run astray almost immediately and will often call to discuss their findings or send in a sample for verification. Those who check their results early generally have not lost much when t hey are confronted with their errors.

In general, assaying scams involve convincing everyone that the "ore" in question is complex or, for some other reason, cannot be assayed by normal methods. Often some special pretreatme nt is required (such as adding a roasting step and then treating the ore with water, leachi ng first with sulfuric acid, subjecting the ore first to an arc similar to an electric welder, and/ or pretreating with sugar or salt) before fire-assaying the sample. Another unsubstantiated claim is that some "ores" are time-dependent: good results can be obtained by fire assay shortly after crushing the sample but values will decrease with time afterwards. I have even heard claims recently that bet ter assay results can be obtained on rainy days.

Sometimes it is said that the ore cannot be fire assayed at all because the gold is i n a volatile form that would be burned off from the sample and lost during fire assaying. While this is larg ely not true, such samples can always be analyzed by standard wet-chemical methods which do not involve heating the samples in high-temperature (1050GC) furnaces.

Spectroscopic instruments are widely used by reputable commercial laboratories and in clude atomic absorption spectrometry (AA), inductively-coupled plasma-optical emission spec trometry (ICP-OES or, simply, ICP), and direct-coupled plasma-optical emission spectrometry (D CP-OES or, simply, DCP). In fact, when used properly, these methods are very accurate and re liable. The

problem usually arises when a wet-chemistry step in the preparation of the samples is eliminated (the organic extraction of the precious metals into methyl iso-butyl ketone [MIBK] and the washing of that organic solvent with hydrochloric acid to remove iron from the organic layer; iron interferes with the spectrometric determination of most precious metals). Without thorough knowledge of precisely what the individual steps in a documented procedure accomplish, and what a modification of a step will actually do, one must not deviate from published analytical methods.

Good wet-chemical methods of determining the quantity of gold in a sample are used routinely by competent laboratories. However, the incompetent or unscrupulous do not use the standard, scientifically established methodology, but modify methods until they get results indicating to them that large quantities of precious metals are present. In fact, what they generally do is totally invalidate a good procedure and arrive at results which they misinterpret as indicating the presence of precious metals. Sometimes this is a consequence of having received sketchy details of the methodology, anecdotally for instance, and unknowingly conducting the analysis incorrectly. Some dabble with developing their own methods of assaying for precious metals but do not have the necessary background and do not understand the quality assurance procedures required to assess the validity of what they have done.

It can be difficult to prove that others have intentionally developed methods that can trick the unskilled into believing that there is value in rocks that actually have none. This is a very common error, or scheme, which causes an erroneous indication of the presence of precious metals when conducting the analysis instrumentally.

Laboratory-Specific Ore-Grade Assays

Certain laboratories repeatedly produce unreasonable data, indicating, in almost any rock, exceptionally high concentrations of one or more precious metals. Some of these assays I have had call to check and, without exception, I have been unable to substantiate claims of very high, ore-grade, concentrations of the precious metals. In fact, we professionals in the mining industry have come to be leery of, if not simply to dismiss, assays from certain towns because of the dismal reputations of the laboratories there.

Several years ago, the Nevada Securities and Exchange Commission (SEC) asked me to help them determine how one laboratory was apparently salting samples from a cinder-cone property that they were promoting by way of inviting people to invest in their project. After being unable to duplicate the results produced by the laboratory in question through umpire assays at other laboratories, the SEC visited the lab and videotaped their procedure for assaying samples. They then obtained, on my recommendation, a sample of all chemicals that were added to samples during the course of the assay so that I could check them for gold contamination. Had I detected contamination of gold in one of the chemicals (which I did not), it could have been argued that the "salting" was inadvertent and that we were dealing with mere incompetents. Results of my contamination check led to the conclusion that gold was being added covertly and intentionally and that an intentional scam was being perpetrated on investors. The SEC went so far as to have me duplicate exactly the assaying steps of the other laboratory, which included the unusual step of adding sugar to the sample at one point, to confirm that their slightly different procedure was not actually responsible for liberating some unassayable gold in the samples. Using their exact methodology and samples did not, of course, result in our being able to detect significant gold in their property's samples because they were covertly salting the samples in their laboratory during assaying. Even careful screening of the videotape of their assaying

steps did not reveal at which step they were doing the salting, however. Unfortunatel y, the SEC determined that they had insufficient evidence with which to prosecute the con artist s and reluctantly stopped pursuing the case.

Some Recurring Property Scams

Property promoters are not stupid people. They often conceive their scams so as to be at least partially believable, even to knowledgeable professionals. The difference between the typical victims of these scams and the knowledgeable professional is that the professional knows how to quickly evaluate and verify or discredit the claims. He does this by calling on extensive kno wledge about geology and ore deposits and through the use of the scientific method to avoid being confused and duped by the promoter.

A couple of examples of attempts to promote platinum-bearing properties in southern N evada and a silver property in Texas illustrate the nature of these endeavors to deceive and extr act money from gullible investors. These investors are gullible in this context if they are not full y versed in economic geology, are not particularly savvy and do not use principles of the scientific metho d, or are not alert enough to realize that they need to employ a consultant to help them effectively eval uate the property and investment. They often are otherwise intelligent, sensible people who can be dece ived about mining claims simply because of their unfamiliarity with the subject.

Playa deposits/Moapa lakebed deposits

Southern Nevada is one of a few areas in the United States where platinum mineralizat ion is known to occur. The mineralization occurs in the lower elevations of a couple of mountain rang es southwest and northeast of Las Vegas. From time to time, promoters try to convince investors th at platinum has washed out of the exposed occurrences in the ranges and has built up to ore grades in the adjacent closed basins in the valleys. In the semiarid West, these normally dry lakebeds in cl osed basins are called playas, and playa scams concerning gold and the platinum-group elements (plati num, palladium, rhodium, ruthenium, osmium, and iridium) recur regularly. The Moapa lakebe d deposits, regionally adjacent to the platinum- bearing Bunkerville mining district northeast of Las Vegas is a favorite area in which to attempt to promote platinum properties. Although it is at l east possible that such enrichment processes occur, I have seen absolutely no reliable evidence that the y have. Colleagues and I have assessed and discredited these scams more than once.

Silver in Texas -- a variation on the theme

One of the boldest and richest mining scams ever recorded occurred in 1976. The amoun t extorted from eager investors was estimated to have exceeded $30 million! Three con artists en ticed investors with a phony proprietary technology which was to extract substantial silver from vast reserves of ore near Llano, Texas (never mind that there was actually no silver in the rocks to be ex tracted).

Up-front money was needed from the investors to secure the mining property in Texas a nd to attract a $10,000,000 loan to build the needed refinery. Investors were told that they would do uble their money in one week and some were enticed to invest substantially. A widow from the Sou th invested $450,000 and a former Chrysler Corporation president invested $150,000. Needless to s ay, investors never realized any profit from their investments and, in fact, lost essentially every thing that they had invested. Was it the con artists' skill and charisma or the investors' eagerness to s ee unbelievable

returns (or both) that resulted in this debacle? The money was funneled into a bank i n the Bahamas where it was essentially out of reach of American officials who eventually were broug ht into the scam to investigate the broken promises. Indictments were obtained but Bahamian officials refused to cooperate and resisted extradition attempts. Investors never recovered their money.

Other favorite areas in which to try to deceive investors include basaltic cinder con es, lavas in general, the Mancos Shale, the Humboldt Sink, purportedly platinum-rich brines in Nev ada, and purportedly gold- rich water in any area. Some promoters try to obtain large loans us ing barrels of mineral concentrates as collateral (or mining properties themselves). Often the conte nts of the barrels or properties are essentially worthless and are simply variations on themes presented above.

The Problem of Quartz Veins

I have probably seen more prospectors confused by quartz veins than any other type of mineralization. There are many examples in the western United States where early pros pectors found outcropping quartz veins containing gold. These miners constructed vertical shafts or burrowed into hillsides to extract the gold-bearing quartz. Many times, however, while the quartz v ein continued underground, it eventually no longer carried gold with it and the miner would abandon the pit or adit. Modern prospectors happening upon these prospects will obtain good assays on residual , high-grade samples that they grab from the wall of the hole near the entrance. Thinking they hav e found a valuable vein, they will begin mining the quartz at depth only to find that they cann ot recover any gold from it.

The problem is that the geologic processes that have deposited quartz in the fracture in the rock are different than the processes that normally cause gold to be deposited. Because of thi s difference in depositional mechanisms for quartz and for gold, the fracture may be filled with quar tz to great depths but the gold may only have been deposited in the shallow portions of the vein. Thus, while the shallow, previously mined portion of the quartz vein contained gold, the modern prosp ector can persistently follow the vein underground until he goes broke without encountering any more gold. A vein that is pinching and swelling with depth, however, may have deposited gold in se veral of the wider parts of the vein while depositing none in the narrow zones. This can make it d ifficult to determine whether a barren zone in the quartz vein may carry gold in a deeper, wider part of the vein. Eventually even these pinching- swelling veins will run out of gold at some depth, ho wever. Prospectors can waste a lot of time and money unjustifiably pursuing gold in barren q uartz veins below productive horizons. Devious promoters can likewise make a worthless vein appea r to be exceptionally valuable by guiding you to sample remnants of the gold-rich, shallow ve in material and indicating that the quartz vein continues with depth. It may indeed continue to some substantial depth but it may have no precious metals accompanying the quartz and may be of little value at all. Be careful!

In* Roughing It*, Mark Twain wrote:
"The sagacious reader will know now, without being told, that the speculative miner, in getting a "fire assay" made of a piece of rock from his mine (to help him sell the same), was n ot in the habit of picking out the least valuable fragment of rock on his dump pile, but quite the contr ary. I have seen men hunt over a pile of nearly worthless quartz for an hour, and at last find a little piece as large as a filbert, which was rich in gold and silver -- and this was reserved for a fire assay! Of course the fire assay would demonstrate that a ton of such rock would yield hundreds of dollars -- and on such assays many an utterly worthless mine was sold."

The Scientific Method and Reliable, Unambiguous Data: How to Avoid being Duped!

Scams generally involve attempts to convince someone that a rock is enriched in gold and/or other precious metals when it is not. Using principles of the scientific method, we can con firm or discount this assertion in an unambiguous, accurate, and reliable way. Let's look at a probabl y familiar analogy to review how the scientific method works and why we have come to trust its results.

We are probably all most familiar with medical studies that make use of the scientifi c method. We have probably all heard (more than once) about blind studies in which one experimenta l group is administered a new medicine while another group is not. The researchers are looking f or differences between the two groups that are unambiguously attributable to the treatment. So the s cientists have gone through the mental exercise of hypothesizing that a medicine will cause an effec t in patients and then designing an experiment to demonstrate conclusively that the medicine does or do es not cause the anticipated effect. Because some results may be psychosomatic, the group not rece iving the treatment is not told that they are the control group and may be given a placebo (for instance a pill that looks like the real medicine but is not). This is called a blind study. However, because the treated group may respond psychosomatically because they know they are being treated with the experimental medicine, they may not be told so either in what is referred to as a dou ble-blind study. These scientists are going to great lengths to be certain that the effects that they see or measure between the two groups are the result of the treatment alone. They are using the scie ntific method to ensure the accuracy and reliability of their results and thereby avoid misinterpretin g the results of their experiment because of unforseen effects or by studying one variable when some o ther variable or variables are actually producing the measured results.

In a similar way, in establishing whether or not a rock contains gold, we must take s teps to ensure that the results of our assay accurately reflect only the presence or absence of gold. We generally do three things during the analysis. First, we carry a blank through the entire analysis, trea ting it as though it were a sample by adding to it all of the chemicals that we add to the real sample in the course of the assay. In this way, we would measure any small amount of gold that we might inadverte ntly add to the sample because we would also add it to the blank as we add the chemicals to them both. Ideally we want to measure zero gold in the blank, indicating that we have been very clean in our analysis. If we do measure a small amount of gold in the blank, we subtract that same amount of go ld from the unknown sample result, thereby carefully monitoring this contamination and correcting for it.

Secondly, we carry a standard along through the analysis. This is a natural sample, s imilar to the unknown, in which we already know the gold content with high confidence. At the end o f our analysis, after treating the standard like just another unknown sample, we expect to find the certified amount of gold in the standard, indicating that our assaying method was an accurate o ne (precious metal standards are available from the Nevada Bureau of Mines and Geology as describe d inside the front cover). And finally, we analyze more than one replicate of a sample, carefully assessing the variation in results between the duplicate or triplicate determinations of gold in a given sample to ensure that we can repeat our results time after time and getting a measure of how pr ecise our analysis is. After having taken these precautions during our analysis we have high co nfidence that we know the concentration of gold in the unknown sample. We have monitored the analysis for inadvertent contamination by including a blank, we have verified the accuracy of the analysis by including a standard (or even several different standards), and we have demonstrated the

reproducibility of our method. We can further assure ourselves that we have the prope r answer by conducting the analysis by two or more entirely different methods. All methods should give similar results.

Final Advice

Before investing money in any mining-related endeavor, seek advice from a knowledgeab le friend or hire a consultant to help you assess the risks inherent in the venture. Spending a li ttle money on a consultant in the beginning may save a lot of money in the long run.

If you are having material assayed, take it to a reputable laboratory (make some tele phone calls to mining companies, state geological surveys, the Better Business Bureau, etc.). If you think that you have found samples that contain ore-grade concentrations of precious metals, have the m re-assayed at a second commercial laboratory to confirm the results; a significant investment ma y hinge on these numbers. If the two laboratories do not agree within some reasonable margin of error, after you have provided them with identical, carefully split samples, seek a third, fourth, etc., un til you are satisfied that you know what the concentrations are with high confidence (samples can be submit ted for assay to the Nevada Bureau of Mines and Geology, see inside the front cover).

While many are attracted to mining because of the potential to obtain riches from roc ks, prospecting or investing in mining is an expensive and risky venture. It is often said that if it sounds too good to be true, it probably is. But in this business, there are indeed some valuable ore deposi ts left to be discovered, so proceed with great care and assistance, if necessary. Be systematic, a pply liberal doses of common sense, and control your "gold fever."

Some Classic Indications of Scams

Although exceptions could occur, the following are typically indications of a scam ra ther than a legitimate orebody. Be cautious if you hear any one of these:

"You must use a proprietary or nonstandard technique to assay the ore."

(Standard analytical techniques unquestionably detect ore-grade precious metals in al l geological materials, such as rocks, soils, or water. Fire assay, neutron activation, inductivel y coupled plasma-mass spectrometry, and atomic absorption spectrophotometry are standard techni ques that, when properly performed, yield accurate assays of gold in ores.)

"There are not only gold and silver but also platinum group elements in the ore."

(Most ores do not have substantial quantities of both platinum and gold. Other platin um group elements, including ruthenium, rhodium, palladium, osmium, and iridium, rarely occur in economically significant quantities in gold deposits.)

"This deposit is so large that it will upset the world market when it is mined."

(Most legitimate large discoveries are bought by major mining companies, not peddled to individual investors.)

"Nearly all samples analyzed have ore-grade concentrations."

(Most ore deposits have pockets or zones of unprofitable waste rock.)

"The ore occurs in rocks, sediments or other materials that rarely, if ever, contain ore in other places in the world."

(We know of no significant precious metal deposits in what appear to be unaltered cin der cones, unaltered lava flows, playa sediment, brine, or groundwater.)

"The ore is substantially higher grade than most ores."

(It is rare to find substantial tonnages of ore, say more than a few thousand tons, c ontaining more than $300 worth of precious metal per ton.)

"All the samples taken during exploration were sent to the assay laboratory."

(Prudent exploration geologists will save splits of the samples from drilling, trench ing, and examining old underground workings to check the assays and to further investigate where the pre cious metals occur in the rocks.)

"Reserves of over a million ounces of gold have been discovered, but few, if any, exp loration holes have been drilled into the deposit."

(The term "reserve" has legal meaning with the U.S. Securities and Exchange Commissio n and should only be applied when there is a high degree of confidence that the stated grade and t onnage of the ore and the total recoverable quantity of gold are known. Generally hundreds of explorati on holes are drilled and thousands of samples are assayed before being able to define a reserve of a million ounces of gold.)

If it sounds too good to be true, it probably is.

Conversion Factors

1 part per billion (ppb) = 1 nanogram per gram

1 part per million (ppm) = 1 microgram per gram = 1 gram per metric ton = 1000 ppb

1 metric ton = 1000 kg = 2205 pounds avoirdupois

1 ounce per ton (troy ounce per short ton avoirdupois) = 34.286 ppm

1 troy ounce = 31.10 grams = 0.06857 pounds avoirdupois

1 pound = 16 ounces avoirdupois = 14.583 troy ounces = 453.59 grams

1 assay ton = 29.167 grams

NBMG Standards

A number of precious metal standards, useful for validating results from commercial l aboratories, are

available from NBMG. These include gold, silver, and platinum-group element standards in several rock-types and concentrations. Call for prices and availability.

Assaying Services at NBMG

The Nevada Bureau of Mines and Geology provides assaying services to Nevada residents and prospectors. Samples can be submitted for the analysis of gold, silver, platinum-group elements, and other constituents if the sample is from Nevada and the individual is a resident of Nevada. Price lists are available from the Publications Sales Office or the Geochemical Laboratory on request. Several reputable commercial laboratories operate in Nevada and elsewhere.

Continuing Education at the University of Nevada, Reno

The Nevada Bureau of Mines and Geology periodically conducts a two-day fire assaying shortcourse through the Department of Continuing Education at the University of Nevada, Reno. Call (702) 784-6691 for details.