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Gold in Texas

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The total value of gold produced to date in the State of Texas is probably less than \$100,000 and may not exceed \$50,000. The production has come as a by-product of silver and copper ores mined in Trans-Pecos Texas and in a small amount from the Heath mine in Llano County.

Anyone contemplating prospecting in Texas for any mineral resource whatever should know that all mineral rights belong to owners of the land surface and that there is no Federal public land which can be acquired gratis by the discoverer of a mineral deposit. Without exception royalties must be paid by the operator, unless he owns the land in fee, either to private owners or to the State.

The regions in Texas that have yielded small amounts of gold are as follows: the Llano uplift, Trans-Pecos Texas, and the Edwards Plateau. In other parts of Texas, so far as can now be judged, gold can scarcely be expected to occur in profitable amounts. A small quantity of placer gold has been found in some of the Eocene sandstones of the Gulf Coastal Plain, but not in profitable amounts.

Llano Uplift of Central Texas

In the Llano uplift gold in the consolidated bedrocks is confined to quartz veinlets and stringers in the metamorphic schists, quartzites, phyllites, slates, and marbles. These rocks are confined to Mason and Llano counties, a narrow strip along the eastern two-thirds of the north line of Gillespie County and a small area in the center of the west part of Burnet County. Even within the area so given half of the surface is occupied by outcrops of barren granite and sedimentary rocks of later date of formation than the metamorphics. Consequently there is not more than 1,000 square miles of area of rocks which might contain any appreciable amount of gold.

Outcrops in the metamorphic area are, moreover, relatively scarce. Most of the surface is covered either by stream-transported gravels, sands, and clays or by residual soils formed by the decomposition of the bedrocks. The amount of outcrop is constantly decreasing because cultivation and over-grazing of the country has led to the growth of a scrub jungle vegetation difficult to penetrate and to choking of the water courses with debris. Both processes have buried much of the formerly outcropping rock.

There are many fairly wide and extensive veins of milky-white quartz in both the metamorphic rocks and the granites, but, so far as known, these do not contain gold or other useful minerals. Pegmatite or graphitic granite, aplite, and spar (feldspar) veins are likewise common and carry some of the following minerals:

quartz, microcline or orthoclase feldspar, mica (biotite or muscovite), fluorite, beryl, tourmaline, topaz, molybdenite, rare-earth minerals, cassiterite, and other minerals. None of these are known to carry any profitable amount of gold. Appreciable amounts of gold so far found appear to be confined to quartz stringers or veinlets which in some, perhaps most, instances probably are merely the "rootlets" of veins which once may have existed in volumes sufficient to be profitable but have been eroded away in the course of time. Gold occurs in these deposits either in the free state or combined with pyrite. Zones of contact between the metamorphics and the granite in places contain bands of pyrite, and such bands are sometimes found in slates and other metamorphic rocks at distances considerably removed from granite contacts, but such of these pyritic bands as have been assayed do not show even a trace of gold.

Erosion of gullies and larger water courses, floods, landslides, and grass and brush fires constantly expose new bedrock outcrops to the view, and it is always within the range of possibility that one or more such processes may bring to light a vein of sufficient size and mineral content to be profitable. Also, for reasons already given, it is apparent to those sufficiently well informed that neither this nor any other possibly mineral-bearing area of Texas has ever been adequately prospected. Consequently, it is foolhardy either to condemn the area or to look on it with any great amount of favor.

The study of the problem of whether profitable placer deposits, derived from the wearing away and subsequent concentration of gold from formerly existing veins, exist in this area requires the consideration of a long and complex geologic history. The gold-bearing veins were formed either during the time when various original ordinary sedimentary rocks --shales, sandstones, and limestones-- were changed (metamorphosed) by heat and pressure into the schists, slates, phyllites, quartzites, and marbles, or after the already metamorphosed rocks were intruded by the then molten granite or other intrusive rocks. After the mineralization, an immense amount of erosion uncovered the surface to the once deeply buried granite and metamorphic rocks. Whatever placer gold was derived from the wasting away of the veins during this truly tremendous erosion remained in part in the residual soils and drainage courses of the area or was transported mainly by stream water to places outside of it.

When the Upper Cambrian sea finally covered the area and deposited the Hickory sandstone and conglomerate, whatever free detrital or residual gold was present was re-concentrated in the basal conglomerate and sandstone beds. In certain localities in these it may exist in profitable quantities, and would be expected to occur in the basal Hickory formation, most likely along old drainage courses, valleys, or channels which were present in the surface of the metamorphic rocks when the basal conglomerates and sandstones were deposited. Long after the formation of these beds the area was faulted and there are now numerous fault-blocks of the Hickory and overlying sedimentary rocks which have been down-dropped and in which the Hickory formation lies at lower levels than do the outcropping metamorphics in adjacent, relatively uplifted blocks. The prospector must be able to discriminate clearly between such blocks lowered by faulting and the original channels and valleys formed long previous to the faulting. Such channels and valleys may be found in the down-faulted as well as the up-faulted blocks, but it will not do to make the error of confusing a block lowered by faulting with one of the ancient channels or valleys in which the gold is liable to have been concentrated by stream and wave wash.

It was during this first epoch of great erosion that conditions for concentrating placer gold were more favorable, first, because a greater amount of erosion was accomplished and, second, because it was probably then that most of the gold-bearing veins were worn away. There have been, however, in the Llano uplift two other and later long periods of erosion of the crystalline rocks during which gold may have been concentrated in placer deposits.

One of these was during the very long time which elapsed between the Pennsylvanian and Cretaceous periods. Whatever gold was freed from the veins and rocks during this time was re-concentrated in the basal sands and gravels of Cretaceous age under the same conditions as already set forth. However, there was relatively little faulting after the deposition of the Cretaceous rocks. The outcrops of Cretaceous form on all sides the bounding rim of the lower central basin of older rocks, and within the basin there is one important outlier which forms the long narrow ridge in northern Mason County known as the Mason Mountains. The rim rock of the Cretaceous is particularly prominent and nearest the uplift on its south and east sides. The basal gravels and sands of the Cretaceous, especially when these fill old valleys and channels in the underlying rocks, are possibly in places gold-bearing in quantities sufficient to be profitable.

Much later the covering of Cretaceous rocks was worn away from the heart of the area and the older rocks, as we see them today, were exposed once more. The drainage lines which uncovered the ancient rocks were all part of the Colorado River system, and the river, as the master stream of the area, controlled their action. The down-cutting of the Colorado River and its tributaries has been slowed down at many places by hard belts or layers of rock. There are similar obstructions along the various tributaries of the Colorado. The two tributaries of the Colorado River which drain sizable areas from which gold may be derived are the Llano River and Sandy Creek. There is probably little gold in the valley of the Colorado River above the mouth of the Llano River at Kingsland, because the river basin above there does not cross any considerable areas which contain gold. Accordingly, the search for placer in present valleys is practically restricted to the valley of the Colorado below Kingsland, and the drainage basins of the Llano River to the east of the west line of Mason County and of Sandy Creek.

Sandy Creek has a drainage basin of 385 square miles. This includes large areas of the metamorphics most favorable for gold as well as the widest variety of different types of intrusive igneous rocks in the whole Llano uplift. Moreover, this basin has exhibited the most extensive and notable gold showings in central Texas.

The upper basin of Sandy Creek is held at a high level by the hard rocks through which the stream flows between Riley and Cedar mountains, in the stretch between Potato Hill and Click Gap. It is along the gorge in this part of the stream's course that the coarser particles of gold, eroded and transported from the upper basin, are apt to have been caught in depressions in the solid rock at the base of the loose wash deposits brought down by the creek. Just south of the Llano-Gillespie county line a narrows in the course of Coal Creek is formed by a serpentine outcrop. The bedrock of the creek bed in this narrows is an excellent place for gold to accumulate, although serpentine bedrock is usually very difficult territory from which to recover placer gold. There is another narrows near the mouth of Sandy Creek.

Above all three narrows noted there are extensive areas of flattish land in the creek basins over which the stream channels have wandered in former times. The divide ridges on these flats are covered with stream-transported sand and gravel. The present major stream courses have cut in places as much as 200 feet below these old valley flats. Much of the placer gold is probably scattered over these valley flats in quantities too small to be profitable, but in certain localities there may be enough gold to be profitable. Such places, if they exist, will be where there once was drainage from a sufficiently rich localized source of gold.

In the time since the old valley flats were formed their areas have been pretty thoroughly dissected by renewal of the down-cutting and erosive power of the present drainage. Considerable re-concentration of gold has taken place in the minor tributaries as well as in the main creeks during this drainage intrenchment or dissection.

The lower courses of Crabapple and Coal creeks, the two principal tributaries, and of the main Sandy Creek itself below Enchanted Rock, carry large amounts of water, much of which is underflow through the sands and gravel. It is precisely these places where most of the unconsolidated placer gold will be found if it exists at all. But the lone prospector, without considerable capital, cannot even prospect these places, let alone work the possible gold-bearing gravels and sands. In order to prospect these stream courses it is necessary to dig a large number of holes down to the bedrock with auger or other types of placer prospecting drills, or, if shafts are sunk, to shut off the water with caissons. Such prospecting is expensive, and if and when such may demonstrate the presence of gold in profitable quantities, the only way in which it can be recovered is with a dredge which is able to dig itself up or down the stream course. It may also turn out that prospecting will show sufficient gold but it may be for the most part in such small particles ("flour gold") that no profit can be made.

The courses of the Llano River and its tributaries can be prospected properly only as set forth in the preceding paragraph, the conditions being similar to those of the Sandy Creek basin.

Trans-Pecos Texas

There is a considerable area in the vicinity of the town of Van Horn and of Lobo railroad station in which there are large outcrops of metamorphic rocks of the same age and nature as those of the Llano uplift, and to which the remarks made already apply in large part. This territory includes the Carrizo Mountains, the southeastern flanks of the Diablo Plateau (Sierra Diablo), the lower part of the western escarpment of the Wylie Mountains, and a small area northeast of Eagle Mountain.

In most of the rest of the mountainous part of Trans-Pecos Texas mineralization has been much later, indeed as late as the time of the last uncovering of the most ancient rocks of the Llano uplift. In these mountains there are numerous areas where intrusions of suitable kinds of igneous rocks have taken place in country rocks also suitable for deposition of gold and other metallic minerals. But up to the present no profitable gold deposits have been discovered and the sum total of profitable metal mines includes only the silver mine at Shafter and the few quick-silver mines of the Terlingua district. Nevertheless, the territory cannot be condemned wholly because of the poor showing it has made. It certainly has not been properly or adequately prospected.

Edwards Plateau

In the Edwards Plateau region there does not appear to be any great promise of profitable gold mining. Some of the intrusive igneous rocks of Uvalde and Kinney counties have a favorable composition but they intrude not very favorable "country" rocks, which are mainly limestone or marls. Very small and entirely unworkable values of gold and silver have been assayed from veins of iron carbonate and oxide in Uvalde County. From Williamson County, 20 miles north of Georgetown, some samples of decomposed limestone heavily stained with oxide of iron, probably derived by oxidation, from pyrite, were found in 1883 and are said to have assayed in small samples proportionate to \$2500 per ton (See reference No. 9). Similar material from near Merton in Irion County is said to have assayed proportionate to \$237 per ton. At neither place was there enough of the ore to work.

Panning for Gold

Free gold either in veins or other bedrock deposits or in placer sands and gravels can be detected by panning. Panning is the process of causing the gold, which is heavier than the other substances, to settle to the bottom of a receptacle by a combination of rocking and semi-rotation of the receptacle. A frying pan, pie pan, hand basin, or dish pan can be used, but it is much more satisfactory to have a regular gold pan or a trough-shaped horn. A regular gold pan is about 18 to 24 inches in diameter and has a side which flares out much less steeply with respect to its bottom than in other pans. It is preferable that the gold pan should be rusty. Vein material must first be finely pulverized before it is panned. Sand or fine gravel of stream deposits, especially that lying directly upon the hard rock or found in pot holes or other kinds of depressions in the hard rock, is placed in the pan but not to its full capacity. Water is added and the pan is rapidly swung back and forth and at the same time gently rocked, both hands being used in the operation. The coarser and lighter particles rise to the top of the solid material during the process, being scraped off from time to time and water added as needed. Much care must be taken with the final stages in which the original panful of "dirt" has been reduced to a teaspoonful or less of the heavy mineral residues. If any gold is present, it will be included in the residue usually along with a large percentage of "black sand" (magnetic oxide of iron). The final operation is a gentle rocking by means of which the particles of gold are concentrated at the higher point of the residue or "tailings", and thereupon become visible.

Horning is somewhat similar to panning but is done by rocking the horn to and fro in one hand and scraping the coarser and lighter material away with the other. In both panning and horning the finer clayey material is removed from coarser particles by washing, that is, rubbing the "dirt" with the hand during the earlier stages of the operation. Clean sand or gravel, which contains little clay or finer "dirt", requires little "washing".

When gold occurs combined with pyrites, it cannot be detected by panning, and the value of the ore can be determined only by assaying.

For placer mining methods the reader is referred to "Gold Placers in California" by Charles Scott Halsey, Bulletin No. 92, California State Mining Bureau, Ferry Building, San Francisco, California; or "Handbook for Prospectors" by E.W. von Bornwitz, published by McGraw-Hill Book Company, New York, Chicago, and San Francisco.

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