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GOLD IN GEORGIA

By

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MINERALS OF GEORGIA

Brief Accounts of Occurences and Developments of the State's Leading Minerals

Reported by THE DIVISION OF GEOLOGY

GOLD IN GEORGIA
Part I

By GEOFFREY W. CRICKMAY,
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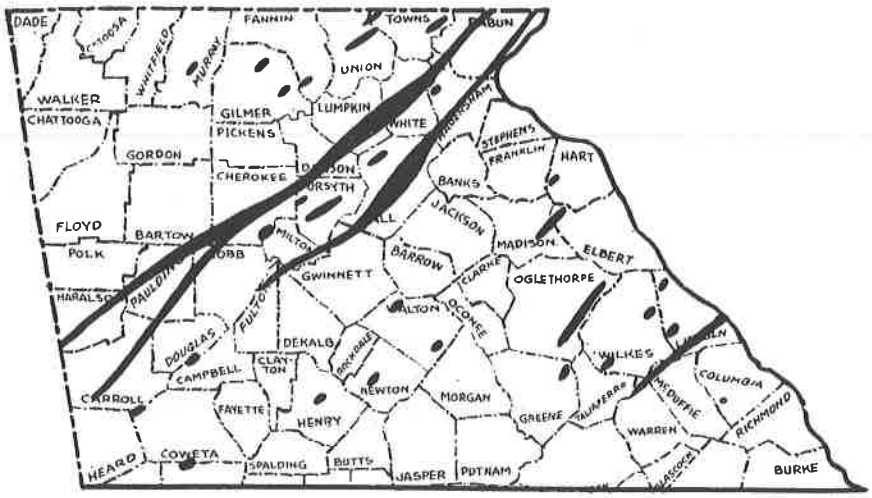
As everybody knows, gold is the standard of American currency. The value of gold expressed in dollars and cents remains always the same—$20.67 an ounce; but in terms of commodities its value fluctuates with "good times" and "hard times". In periods of depression, such as that in which the world now finds itself, the purchasing power of gold is greatly increased; consequently, abandoned mines can be reopened and old gold fields reworked at profit. It must be remembered, however, that the margin of profit in such cases is entirely dependent on depressed prices, and profitable mining is as transient as these prices are. These conditions do not justify large-scale development with large capital investment in machinery, but they do favor small-scale operations for which no great initial outlay is necessary. It is to the small-scale operator, to those otherwise unemployed who seek to earn wages by washing gold from the earth, and to those who have a more casual interest in gold and gold mining, that the following remarks are addressed.



Map of North Georgia showing the distribution of gold deposits (after S. P. Jones, Georgia Geol. Survey, Bull. 19, 1909)

The present widespread interest in gold is reflected in the great number of inquiries that have come to the office of the State Geologist during the past few months. It is here proposed to answer some of the common questions asked: Where and how does gold occur? How does one test for gold? How is it mined? Can wages be earned by panning gold from the creeks of Georgia? But most frequent of all is the question: How is the mineral recognized?

Unlike most other metals, gold occurs in nature uncombined with other elements, that is, in a native state (with the exception of a few rare tellurides). The mineral possesses a golden yellow color with a metallic lustre. It is soft and malleable, a property that distinguishes it most readily from pyrite (fools' gold) which is hard and brittle. A particle of gold can be hammered out on an anvil to paper thinness, whereas pyrite, similarly treated, would be crushed to a powder. The same treatment will distinguish gold from scales of golden-colored mica with which it is more often confused. In actual practice, the prospector recognizes the metal by its color and lustre which are distinct from all other minerals, including pyrite and mica. It is more than seven times heavier than quartz, its most common associate, but as it usually occurs in minute particles, this high specific gravity is not easily recognized. The gravity separation of gold from quartz and other minerals by washing with water in a gold-pan or sluice box is entirely dependent on such differences of weight. The mineral is reacted on by very few chemicals, of which chlorine and potassium cyanide are the most important from the standpoint of milling. Ordinary acids do not attack gold, but mercury will dissolve it readily. This attraction of gold to mercury has long been known and is employed in separating the gold particles, particularly the very fine grains, from the waste rock or gangue.

Many kinds of rocks in all parts of the earth contain mineral gold in minute quantities. Even sea water contains traces of the metal (about an ounce in 8,500 tons of water). However, gold ore deposits, that is, deposits that can be worked profitably, are restricted to comparatively small areas. The Southern Appalachian region, including parts of Alabama, Georgia, the Carolinas, and Virginia, was one of the first producing areas in the United States. In the richest part of this field, at Dahlonega, Georgia, the United States government established a branch mint (a branch mint was also established at Charlotte, N. C.) which during the 23 years of its operation (1838-1861), minted a total coinage of more than six million dollars. Following the development of the richer western fields, Georgia lost and never regained its commanding position as a gold producing state. At the present time, contrary to popular opinion, an almost insignificant fraction of the country's total production is obtained within the state.

The gold deposits of Georgia are of two main types: (a) Lode deposits, consisting of quartz veins in solid rock; (b) placer deposits, comprising gold-bearing sands and gravels in stream valleys. Placer deposits are derived from lode deposits simply by weathering and disintegration of the quartz veins, the transportation and sorting of this debris by streams, and its deposition in the stream valleys. In all cases the lode deposits are the original source of gold, and consequently the distribution of gold quartz veins determines to a large extent the location of placer deposits. The accompanying map shows the location of the most productive areas in the state. It is noteworthy that the mineral is largely restricted to certain belts, the most important of which are the Dahlonega belt, extending from near Tallapoosa, northeastward through Dahlonega to Rabun county, and the McDuffie county belt, extending through portions of Warren, McDuffie, Wilkes, and Lincoln counties.

These belts are made up of ancient banded rocks known to the miner and geologist as schists and gneisses. In the Dahlonega belt the gold is closely associated with a gneiss containing a dark green to black mineral known as hornblende and the rock is called a hornblende gneiss. However, hornblende gneiss does not occur in all the gold belts, nor does its presence by any means insure the existence of gold ore. In a general way, the gneisses of the gold belts are finer-grained than those of the intervening areas for they have suffered certain shearing movements that have made them particularly accessible to gold-bearing solutions from deep within the earth. The trend of these gneisses and schists is northeast-southwest, and the trend of the lode deposits within them is roughly in the same direction. The dip of the gneisses is nearly

everywhere steep to the southeast (average 55° in Dahlonega belt) and the ore bodies conformably dip in the same direction.

It is advisable for the prospector to confine his search within the gold-bearing areas shown on the map, for in view of the fact that the state has been prospected for more than one hundred years, it is quite unlikely that any important new orebodies will be discovered. In any attempt to rework an abandoned deposit, it must always be remembered that the early prospectors did a thorough job and that mines or placers were abandoned only when they became unprofitable. Romantic stories of fabulously rich lost mines and fantastic tales of Indian gold handed down from one generation to another should not influence the honest and critical investigation of the small-scale operator, for no large returns are to be expected. To a limited extent, the gold fields of the state offer an opportunity to earn small wages during the present period of decreased costs and general unemployment.

In a second section of this article on Gold in Georgia, the writer will review very briefly the nature of the deposits most easily worked on a small scale, the manner of testing these deposits, and the best methods of extracting the gold. Those who desire detailed information on the gold deposits of the State should consult Bulletin No. 19 of the State Geological Survey by S. P. Jones. There are a number of books on the subject of gold mining that may be consulted for more general information. A recent circular by the U. S. Bureau of Mines[1] should prove particularly helpful.

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[1]Small-Scale Placer-Mining Methods Chas. F. Jackson and John B. Knaebel, U. S. Bureau of Mines Information, Circular 6611, April, 1932.

MINERALS OF GEORGIA

Brief Accounts of Occurences and Developments of the State's Leading Minerals

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GOLD IN GEORGIA

Part II

By
GEOFFREY W. CRICKMAY

In a previous article discussing the status of gold mining in Georgia, the writer has pointed out that to a limited extent the gold fields of the state offer an opportunity to earn small returns during the present period of decreased costs and general unemployment. In the same article, the distribution of gold deposits in Georgia was discussed and it was shown that the mineral is largely restricted to certain narrow northeast trending belts, in which occur lode and placer deposits.

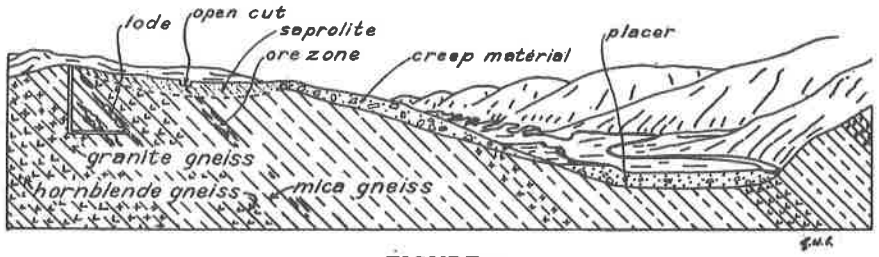

FIGURE 2.
Diagrammatic cross-section of a North Georgia stream valley showing the relations of lode, saprolite, and placer.

The lode deposits consist of either a single large quartz vein, or more commonly a collection of narrow lenticular veins closely spaced in an ore zone. The gold occurs as minute particles in the quartz and is usually quite invisible to the naked eye, although it can sometimes be seen with a small hand lens magnifying ten or twelve diameters. Quartz veins abound in all the gneisses and schists, and most of them do not contain any gold, so that in each case it is necessary to test the vein. In many cases gold is indicated by the presence of other metallic minerals, such as pyrite, pyrrhotite, and chalcopyrite, and more rarely by galena and sphalerite. But even the presence of these minerals is by no means certain evidence of the presence of gold. The most practical test is to pan a crushed sample of the quartz vein, as described below.

The mining of these lode deposits requires the technical knowledge of an expert, for in most cases underground methods must be employed. The extraction of the gold involves crushing in a stamp mill and the collection of gold on an amalgam (mercury) plate or, with more refractory ores, treatment with potassium cyanide, or flotation with oils. For these reasons, the lode deposits cannot be worked by those unfamiliar with such methods, nor by those with little capital to invest in machinery.

In certain areas, particularly in the Dahlonega belt, the lode deposits have been thoroughly decomposed near the surface to incoherent clay soil containing gold-bearing quartz, and are similar in many respects to the placer deposits described below. In some places this loose weathered material, known to miners as saprolite (strictly rotten stone), extends to a depth of 100 feet, and where it contains numerous stringers of gold-bearing quartz, it may form important ore bodies. The deposits are mined by directing a powerful jet of water through a large nozzle with constricted opening, or giant, as it is called, on to the decomposed material, a method known as hydraulic mining. In this manner the loose earth, stones and gold are washed down; the fine material is passed through a sluice and washed, as with true placer deposits; the large quartz boulders are hauled to the stamp mill and treated in the same manner as ore from a lode deposit. This system of mining decomposed lode deposits by open cut methods was largely developed in Georgia, and for this reason is known as the **Dahlonega method.**

The placers, consisting of sand and gravel containing fine gold and nuggets, are the most important group of deposits from the standpoint of gold recoveries and they have yielded probably more than 90 per cent of the total production of gold in the state. In some gold areas, particularly in Alaska, the placers may occur in elevated benches or in channels that the streams once occupied but have since abandoned; but in Georgia nearly all the gold-bearing gravels are found near the level of the streams that deposited them, as, for example, those along Chestatee and Etowah rivers. The placers are found near the lode deposits for they have been derived directly from them by the breaking down of the lode material by the action of weathering, the transportation of this debris by surface rain water and streams, and finally by its deposition where the stream currents are not strong enough to carry the heavier and coarser material down stream. In the process the rock is broken up and worn into sand and gravel, thus liberating to a large extent the gold contained in it. In transportation of the debris down the stream, there is a rough assortment of material that has been likened to the jigging process of certain concentrating plants. The gold and other heavy minerals, together with the largest stones, are deposited first, that is, nearest to the lode from which they were derived; whereas the lighter and finer materials are carried on downstream. The river channel is nature's own sluice box, the means by which low-grade lode deposits are concentrated to comparatively rich placer deposits.

All the gravel deposits along the streams crossing the gold belts do not contain gold in workable quantities, and each deposit must be thoroughly tested before any extensive mining is started. To this end test pits are dug to bed rock at regular intervals and the material from each pit is panned for gold. The gold pan is shaped like an ordinary frying pan without a handle, but is broader—twelve to eighteen inches, somewhat deeper—two to two and a half inches, and the edges slope in at a lower angle. The material to be tested, either crushed quartz, saprolite, or gravel, is placed in the pan and the whole is submerged below water, preferrably in a stream. The pan is then shaken to and fro so as to break up the material, and the stones and pebbles are picked out. The agitation of the sand remaining in the pan causes the lighter material to wash out over the edges, until finally only the gold and heavy minerals are left. The heavy residue is examined for "colors", which will be in the form of little flakes of native gold. The procedure is simple and yet there is a considerable knack to it that comes only with practice.

It has been estimated that one man can pan about one-half a cubic yard of gravel a day which means that, in order to make wages, the gravel must yield at least $2.00 a cubic yard. Most of the placer deposits of Georgia contain less than $1.00 worth of gold in a cubic yard and for this reason they cannot be worked profitably by such a slow and laborious procedure as panning. Some other method, by which a great amount of material can be moved and washed, must be employed. The most common is the sluice box, operated in conjunction with pick and shovel, drag-line, or giant and water lift to bring the gravel to the head of the sluice box.

A sluice box consists simply of a long flat-bottomed wooden trough 12 to 120 feet in length, arranged with a gradient of 4 per cent to 6 percent, that is, a drop of

from five to eight inches in each 12-foot section. The length, width and slope of the box depends largely on the type of material to be washed; a wide, shallow sluice is used for fine gold in sand; a narrow, deep sluice is best for gravel. On the bottom of the box is placed a set of riffles, constructed so that they may be removed when the sluice is cleaned up. A riffle is essentially a projection on the bottom of the sluice to collect the particles of gold and may consist of stones, poles, cut lumber, or angle iron, arranged either across or parallel to the length of the sluice.

The successful operation of a sluice box requires primarily a good supply of water and a land surface sloping sufficiently to permit the required gradient to the box. In the bottom of stream valleys where this gradient cannot be obtained, but where there is sufficient water, the sluice box is set on a trestle and the gravel pumped up to its head by a hydraulic elevator.

Where the gold is fine and the gravel coarse, it may be advantageous to place a grizzly at the head of the sluice box so as to remove the large stone. A simply-constructed grizzly consists of a number of short sections of railway track spiked down in parallel arrangement and about three inches apart. Where there is much fine gold the use of burlap, sacking, or blankets in the lower part of the sluice is sometimes resorted to, but in this case a screening system becomes essential. Mercury is commonly used in the riffles when the sluice is cleaned up to help collect the finest particles of gold which otherwise might escape.

Under particularly favorable conditions a deposit may be worked for less than five cents a cubic yard and with adverse circumstances the cost may be as high as a dollar a yard. Conditions vary with each deposit and the best method of mining represents a compromise between these conditions and the money that can be expended. The most practical method is largely determined by experiments and experience. The reader should not gain the impression that a vast opportunity exists or that large returns can be obtained, for neither condition prevails. The mining of gold requires, first, sufficient capital to tide one over early mistakes and misfortunes; it demands cautious judgement in selecting a point to start operations and, in most cases, the permission of the property owners; and it necessitates long hours of laborious and patient toil. Working under such conditions, those who associate gold mining with romantic adventure will soon be disillusioned.

In this article the writer has sketched very briefly some of the main features of the gold deposits of the state with particular regard for hand-labor methods of mining. The situation is more encouraging in the case of idle mines that, with a moderate investment, could be worked with modern machinery and up-to-date methods. In this way employment is created, not only in the mines but also in related and dependent industries. Limitations of space prohibit a fuller treatment of the subject, but those interested may obtain detailed information or advice by calling at or writing to the office of the State Geologist, at the State Capitol.