**How much gold is there at Hutti?**

It is our firm conviction that the potential for increasing gold production in this country is considerable and the miserable state of our present performance is the result of lack of vision and action on the part of the official agencies, which have controlled gold mining and exploration for the past 30 years.

While every country in the world has taken active steps to improve production as revealed by the table given below, India has the distinction of reducing its production during the same period from 2.5 tonnes to 1.6 tonnes!

<table>
<thead>
<tr>
<th></th>
<th>1980 (Tonnes)</th>
<th>1990</th>
<th>% increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>11.5</td>
<td>26.2</td>
<td>128</td>
</tr>
<tr>
<td>N.America</td>
<td>82.1</td>
<td>460.1</td>
<td>460</td>
</tr>
<tr>
<td>S.America</td>
<td>88.7</td>
<td>211.9</td>
<td>139</td>
</tr>
<tr>
<td>Asia</td>
<td>33.2</td>
<td>74.1</td>
<td>123</td>
</tr>
<tr>
<td>Australia</td>
<td>32.3</td>
<td>285.0</td>
<td>782</td>
</tr>
<tr>
<td>S.Africa</td>
<td>675.1</td>
<td>605.4</td>
<td>-10</td>
</tr>
<tr>
<td>Rest of Africa</td>
<td>33.1</td>
<td>71.3</td>
<td>115</td>
</tr>
</tbody>
</table>

The extent of cratonic area exposing auriferous granite-greenstone terrain in all the gold producing countries is more or less the same. Geological conditions are also similar. There is apparently no reason therefore, as to why India should not find a place in the list of countries producing substantial amounts of gold. While in other countries a large number of mines contribute to production, in India, there are only two mines which have shown significant production and even these two are languishing without any perceptible increase in output.

Since 1989 we have been pleading for a bold policy of increased exploration and exploitation effort by creating a Gold Authority, much in the same way as the Oil and Natural Gas Commission. In order to focus attention of the official agencies on this topic, we sought to include it as a subject in the agenda of the last meeting of the Geological Programming Board.

But to our deep dismay the suggestion was brushed aside as not worth considering.
Fig.1. Diagram showing the surface expression of different reefs at Huttí mine. Solid portions indicate extent developed underground.
In order to remove the prevailing misconception about the non-availability of substantial quantities of gold in the Indian craton, we attempt here an exercise at estimating, albeit very approximately, the quantity of gold present in a specified block of auriferous greenstone terrain presently under exploitation. We have chosen for this analysis the Hutti Mining Block for which a considerable volume of valuable information is available.

The Hutti Mining Block is 2.44 km long, 2.12 km wide, (about 5 sq. km in area) and is located about 80 km west of Raichur in Karnataka. To date a total of 9 reefs, 3 of which merge and diverge again along both strike and dip, have been discovered and 7 reefs are currently under exploitation. Most probably, all the reefs were explored by ancient miners although ancient workings have been positively identified on 6 reefs only. From east to west the reefs are (Fig.1.):

1. **New East Reef**: Not developed as surface sampling and drilling indicated poor gold values.

2. **Strike Reef (Footwall)**: As indicated in Fig.1 this reef merges with its hanging wall neighbour, Strike Reef (Hanging-wall), at places, but is a separate entity over much of its strike length. Developed since 1960.

3. **Strike Reef (Hanging-wall)**: This is the main component of the Strike Reef group which has quite large ancient workings of considerable size. Reef width is higher than other reefs due to quartz blows. It has been under exploitation by the Hutti Gold Mines Co., Ltd. since 1946.

4. **Village Reef**: Ancient workings exist over considerable strike length and to a depth of over 40 metres. This reef of average width was exploited to a maximum depth of 185 metres by the Hutti (Nizam's) Gold Mines Company between 1902 and 1919, and since 1946 has been worked by the Hutti Gold Mines Co. Ltd.

5. **Zone I Reef**: Ancient workings of up to 62 metres and undetermined strike length exist on this reef, also of average width, which has contributed relatively high grade ore during operations by the Hutti Gold Mines Company Limited since 1948. At one point it merges with Village Reef.

6. **Middle Reef**: This reef of less than average width also contains areas of relatively high grade ore and has been exploited by the Hutti Gold Mines Company Limited from 1958. No ancient workings discovered.

7. **Oakley's Reef**: Investigated by the Hutti (Nizam's) Gold Mines Company but not exploited. Exploited by the Hutti Gold Mines Company since 1946. Average width of reef is greater than that of other reefs, except Strike Reef (Foot-wall), due to very wide 'blows' of quartz. Ancient workings on this reef are smaller in extent than on other reefs.

8. **Prospect Reef**: Developed from a deep (107 metre) ancient working. Average reef width is less than most other reefs and the grade is low/

9. Main Reef: This reef was the chief source of gold for the Hutti (Nizam's) Gold Mines Company between 1902 and 1919, being developed below a very large ancient working with a maximum depth of about 200 metres (the deepest known ancient working in the world). The reef was explored to 1,060 metres depth by that company and extensive stoping was done, with stopes of up to 5 metres width, between the 77 metre and the 720 metre levels. Average reef width estimated to be about 2 metres. Under re-investigation by the Hutti Gold Mines Company.

Production statistics

**Known reef lengths, development and widths.**

<table>
<thead>
<tr>
<th>Reef</th>
<th>Surface extent (m)</th>
<th>Underground development (m)</th>
<th>Maximum depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strike (FW)</td>
<td>1,650</td>
<td>740</td>
<td>575</td>
</tr>
<tr>
<td>2. Strike (HW)</td>
<td>2,200</td>
<td>920</td>
<td>730</td>
</tr>
<tr>
<td>3. Village</td>
<td>1,950</td>
<td>700</td>
<td>755</td>
</tr>
<tr>
<td>4. Zone I</td>
<td>2,650</td>
<td>1,110</td>
<td>755</td>
</tr>
<tr>
<td>5. Middle</td>
<td>2,500</td>
<td>795</td>
<td>790</td>
</tr>
<tr>
<td>6. Oakley's</td>
<td>2,500</td>
<td>1,495</td>
<td>790</td>
</tr>
<tr>
<td>7. Prospect</td>
<td>1,100</td>
<td>500</td>
<td>200</td>
</tr>
<tr>
<td>8. Main</td>
<td>2,400</td>
<td>500</td>
<td>1,060</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>16,950</td>
<td>6,760</td>
<td>40</td>
</tr>
</tbody>
</table>

Average reef widths for estimating tonnages:
Reefs nos. 2 - 7 (Village mine) 2.37 metres
Reef no. 8 (Main mine) 2.00 metres

Overall width 2.32 metres

**Production data**

Production records indicate that between 1902-1919, a quantity of 4,40,100 tonnes were produced from the Main and Village Reefs with an average grade of 19.45 gm/t. Ore produced from all the reefs (except Main and New East) for 1948-1994 is 57,15,000 tonnes of an average grade of 6.40 gm/t. The total quantity of ore produced
till date is 61,64,000 tonnes with an average grade of 7.13 gm/t. Total gold recovered is 43.9 tonnes.

**Estimated availability of Gold**

In arriving at an estimate of the possible quantity of gold available within the Mining Lease Block of Hutti Gold Mine, the following permissible assumptions have been made. The most important is the one which assumes that all the reefs will continue to persist to a depth of 3 km. Such an assumption is warranted by the consistent behaviour of the reefs upto 1 km depth and the fact that at Kolar, reefs are known to persist without any radical changes to depth of 3 km and beyond. The second major assumption is that the reefs persist along the strike over the full extent of the lease block. This assumption is warranted by the surface indications and the presence of ancient workings throughout the length. Assumption regarding width and grade over the undeveloped extension of the reef are based on actual mine sample data. Only a very conservative grade has been assumed. The basis for calculation and estimated gold content are detailed under (a) to (e).

(a) **Actual in situ grade of ore produced**
- Main Mine : 22 gm/t (19.45 gm/t recovery plus 2.55 residues) (estimated)
- Village Mine : 6.7 gm/t (6.40 gm/t recovery plus 0.30 residues)

(b) **Estimated grade of all development**
- For Main Reef it is 8.32 gm/t and for Village Mine Reefs 3.97 gm/t.

(c) **Estimated overall grade over surface strike length**
- This is based on the overall development grade indicated under (b) and an assumed grade of 1.5 gm/t for the Main Reef and 1.0 gm/t for Village Mine Reefs, for the remaining surface strike length. The overall grade is 2.74 gm/t for the Main Reef and 2.16 gm/t for the reefs of Village Mine.

(d) **Estimated reef tonnages to a depth of 3000 m**
- (1 m$^3$ = 2.5 tonnes)
- For Main Reef the estimate works to 36 million tonnes (2.4 km x 3 km x 0.002 km x 2.5) and 259 million tonnes for Village Mine Reefs (14.55 km x 3 km x 0.00237 x 2.5).
(e) Estimated gold content

This is based on the tonnage indicated at (d) above and grade under (c). For the Main Reef the figure is 99 tonnes and for the Village Mine Reefs 559 tonnes. This makes the total gold content in the reefs to a depth of 3 km, 658 tonnes. Of this 44 tonnes have been extracted already leaving 614 tonnes which is available for extraction to the extent possible.

The above analysis makes it clear that in a small block measuring only about 5 km² there is a reserve of not less than 658 tonnes of gold to a depth of 3 km, and valued, at the present price of gold at more than Rs. 30,500 crores. Of this, a quantity of 44 tonnes with a current value of about Rs. 2000 crores has been removed during 20 years of operation in the early part of the century and the last 46 years.

Exploration in greenstone belts has apparently been restricted to areas of known auriferous character, indicated by ancient workings and those from relatively recent mining during the boom period of 1880-1910. In a majority of cases all such areas have not been subjected to further investigation. Such work has been inhibited by the lack of adequate capital formation due to official policies relating to taxation, labour and finance. The high cut-off grade necessarily adopted by Mining Companies has resulted in large areas of low-grade material being left unexploited. This has to be set right by improving productivity and by adoption of better management practices.

The total extent of the Hutti-Maski Schist Belt is 518 km². The entire belt is known to be auriferous; numerous ancient workings testify to the ubiquitous distribution of gold throughout the belt. The gold contained in the entire belt must run into several thousand tonnes. We have no doubt that the Hutti field has the potential of becoming a giant producer of gold.

The exploration carried out by official agencies in recent years has been largely superficial, scratching only the surface and sampling methods have often been defective. The distribution of gold being erratic, small split drill core samples selected for assay are not truly representative. Recent trials with a Knelson concentrator have shown that vein material previously reported as barren has yielded as much as 3 gm/tonne. This is because of the larger sample treated. Exploration agencies have failed to equip themselves so far with advanced sensitive analytical instruments capable of rapid analysis even up to ppb level. The background values of Au in the different lithologies of the greenstone terrain are not known. Very often only the actual quartz reef has been sampled leaving aside the usually much wider altered wall-
rock zone which also contains appreciable quantities of gold. A totally different exploration strategy has to be evolved.

Our appeal is to break away from the past and examine the prospect of gold mining *de novo*. There can be no excuse for not expanding the mill capacity at Hutti. If we keep on dilly-dallying and take no effective action we will be reduced to the position of mere onlookers who have not realised the value of the wealth which is in their possession.

It must be admitted that our progress has been painfully slow. What is now required is political will to forge ahead and translate slogans into practice. The creation of a Gold Authority fully empowered to take decisions is a crying need. Only determined action at all levels can be expected to yield encouraging results.

B.P. Radhakrishna
L.C. Curtis