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THE ROLE OF GEOCHEMISTRY IN GOLD EXPLORATION

IN THE GREENSTONE BELT OF SURINAME

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ABSTRACT

This paper presents the interpretation of gold assay results from a regional geochemical sampling program in north-eastern Suriname. In the region that forms the basis of this report, an area of about 4.000 Km2 was sampled at a density of about 1 sample per 2 Km2. Gold was analysed by Atomic Absorption Spectroscopy.

Non-moving mean values for cells 2,5 Km x2,5 Km were computed and the results contoured. Nine areas with mean values greater than 0,2 ppm. have been demarcated and these are discussed in relation to the known regional geology and limited exploration data where available.

It is noted that the result of this study shows close correspondence with the limited exploration data and the suggestion is made that the relationship of the various demarcated areas to the known geology, points to the possible ocurrence of both epigenetic and stratabound gold mineralization.

INTRODUCTION

This paper represents a synthesis and preliminary interpretation of gold results obtained on over 2500 stream sediment samples, collected over about half of the area i.e. 4.000 Km2 covered by C.B.L. mapsheets 21, 22, 30 and 31 (Fig. 1). This represents a sample density of a little over 1 sample for every 2 Km2. Several other elements eg. Cu, Ni, Cr, Zn etc., were done, but this report is only concerned with the gold results.

Details such as individual sample number and description, coordinates of location, etc. , are obtainable in the individual reports under the name of the geologist who supervised the geochemical sampling program. These reports are available at the Geologisch Mijnbouwkundige Dienst, Suriname (G. M.D.).

The geologists involved, the period during which the survey was carried out and the mapsheets are as follows:

Geologist	Period	Mapsheet
den Hengst, P.	1974-1978	30a,b,c,d
Dahlberg, E.H.	1979-1980	22a,b,c,d,
Jharap, S.E.	1979	30b, 31a
Pollack, H.	1979-1980	21c,d
Jharap, S.E.	1980	30a.

LOCATION AND ACCESS

The area covered by sheets 21, 22, 30, 31, lies in the northeastern part of Suriname (see index map, fig. 1) and straddles the Saramacca River in the west and the Suriname River in the east. The Prof. W.J. van Blommenstein Storage Lake covers more than three quarters of the area in mapsheet 31.

From Paramaribo the eastern section can be reached either by river travel up the Suriname River or by road along the Weg-Naar-Affobakka, which links the Hydro-electric Station with the Bauxite operations at Paranam and then to Paramaribo. From Berg en Dal along the Weg-Naar-Affobakka thereare branch roads to Brownsweg and to the De Jong Zuig area. The western section can be reached from Paramaribo by first travelling along the road to Zanderi, the International Airport, then along the westroad passing through the proposed hydro-power/bauxite area in the Bakhuys of West Suriname. This road crosses the Saramacca River at about 20 km from Zanderi, from which point travel may be done by boat along the river. Alternatively one may travel further along this west road for about another 15 Km from the point where it crosses the Saramacca River and then along a branch road to a village, Loksie Hatti, located on the left bank of the Saramacca River. Travel within the area is then partly by river along the larger tributary creeks, but mainly on foot along lines which have to be cleared in the forest. During the surveys which forms the basis of this reports, a total of over 1400 Km of mainly creek and to a lesser extent compass lines were cut.

SAMPLE COLLECTION

In the course of the various surveys over 2500 stream sediment samples were collected for analysis. Some heavy mineral concentrates, rock samples and soil samples on a few grids laid out over certain areas of interest, were also taken. However, the latter samples are not discussed in this report, but their locations and the results obtained are available in the individual reports referred to earlier.

The stream sediment samples were collected along the smaller tributary creeks generally with widths of less than 2-3 meters, representing a drainage area of between 10-25 Km2. This was accomplished either by traversing the 2nd order creeks, which drain into the main rivers, viz. the Suriname River and the Saramacca River and then going along the smaller tributaries, where these are found to flow into the 2nd order streams.

Alternatively traverses were made along lines cut on a compass direction, which generally is at right angles to the general direction of stream flow within a limited area, then traversing the smaller creeks which cut such lines. Samples were generally collected at intervals between 300-500 meters along creek traverse.

Care was exercised to ensure that the stream sediment samples were collected in active streams wherever possible. Nevertheless because the surveys were undertaken over an extended period of time there are usually about 4 field periods each of about 2 months duration in a year - there were inevitable seasonal variations with respect to the amount of water available and therefore the strength of stream flow, etc. In fact the crew under Jharap, which sampled part of sheet 30a during the first field period 1980, had to call a premature halt to the proposed sampling program when a severe dry spell led to a drying up of most creeks and also made travelling on the Saramacca River above Loksie Hatti extremely dangerous. One other instance in which an active stream would not have been encountered was where small dry gullies or rivulets were encountered. Nevertheless, because these gullies provided stream sediments and because they represented relatively small drainage areas, they were as a rule, sampled. At these locations care was taken to collect the finer material which lay below and between the coarse pebbles and blocks.

When a normal stream sediment sample was collected, the finer material from sand size and below was aimed for. Moreover, a composite sample collected from about 3-4 points within an area of about 5 metres radius was taken. Sample weight have varied from about 100 to 250 grams. The samples were placed in either plastic bags or cotton bags, which were numbered. At the time the sample was collected a note was made in the field note-book, recording the sample number and giving a description of the sample and characteristics of the stream at the sample point. The sample point may have been located on the field map at that time if enough of a control was present. Nevertheless, the prospector at all times carried out a pace and compass survey along the traverse, which was recorded in his field note-book.

On his return to camp, he plotted out his traverse on graph paper, noting the location of his sample points. This information was then transferred to the field map. Having carried out these surveys, the prospectors were able to make minor corrections on the base map used. These corrections are then incorporated when the fair copy maps are prepared in the drawing room. Once the samples reached camp, cardboard labels were prepared and attached to each sample. These labels give details as to the sample number, date of collection, name of collector and supervising geologist, mapsheet in which the sample was collected and type of sample.

Once a crew returned to headquarters, a copy of the sample location map was submitted to the drawing room. There the coordinate of each sample location was read off and this was recorded in the report prepared.

LABORATORY TREATMENT OF SAMPLES

Some amount of sun drying was done on the samples in the field, but drying was completed in the laboratory, where they were ovendried at 105 $^{\circ}$ C. Each sample was then sieved and the -80 mesh fraction retained for analysis. This was done for all samples except the samples collected by Pollack, sheet 21, for which the -120 mesh fraction was used for gold analysis. It has now become standard practice (as from the middle of 1980) for the -120 mesh fraction to be used for gold analysis. For the analysis of other trace elements either the -250 mesh or the -400 mesh fraction is now being used at the G.M.D.

This change from using -80 mesh fraction for AAS analysis has come about because of recommendations made by Zeegers and Pollack (1980).

A brief description of the analytical method for gold reads as follows: Geochemically bound gold is determined on a -120 mesh sample after room temperature dissolution of gold in a mixture of hydrobromic acid and bromine.

Subsequently, auric bromine is extracted into an organic solvent (MIBK). The gold content of the organic phase is measured by atomic absorption spectroscopy. For a three gram sample the limit of detection is 0.03 parts per million of gold.

Analytical results for gold are reported in the unit ppm x 10^{-2} and this unit has been used in the values plotted in fig. 2 and 3.

RESULTS

After the results were obtained from the laboratory, they were plotted for the individual samples on a scale of 1:40.000. These diagrams are available in the individual reports referred to above.

Figure 1

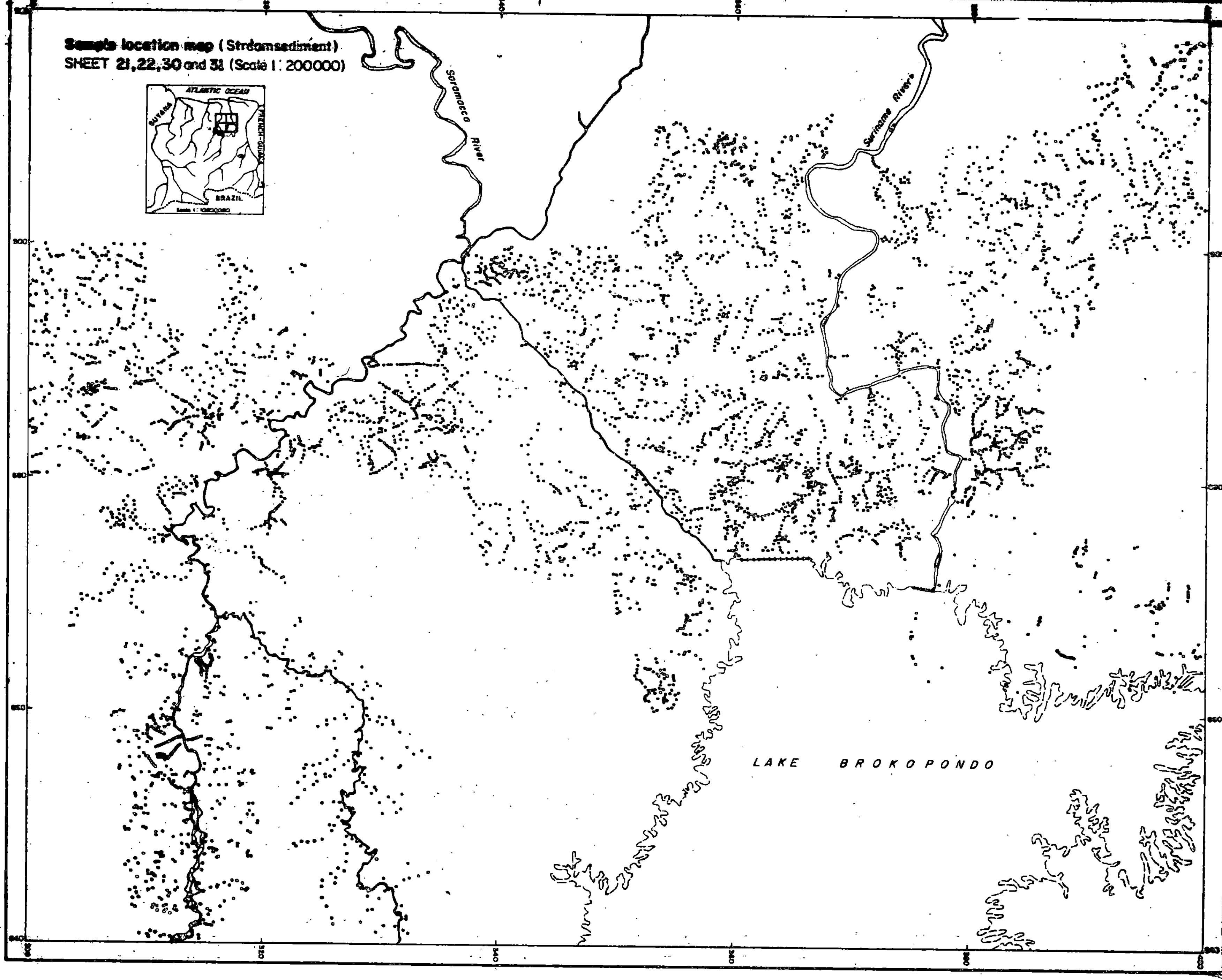
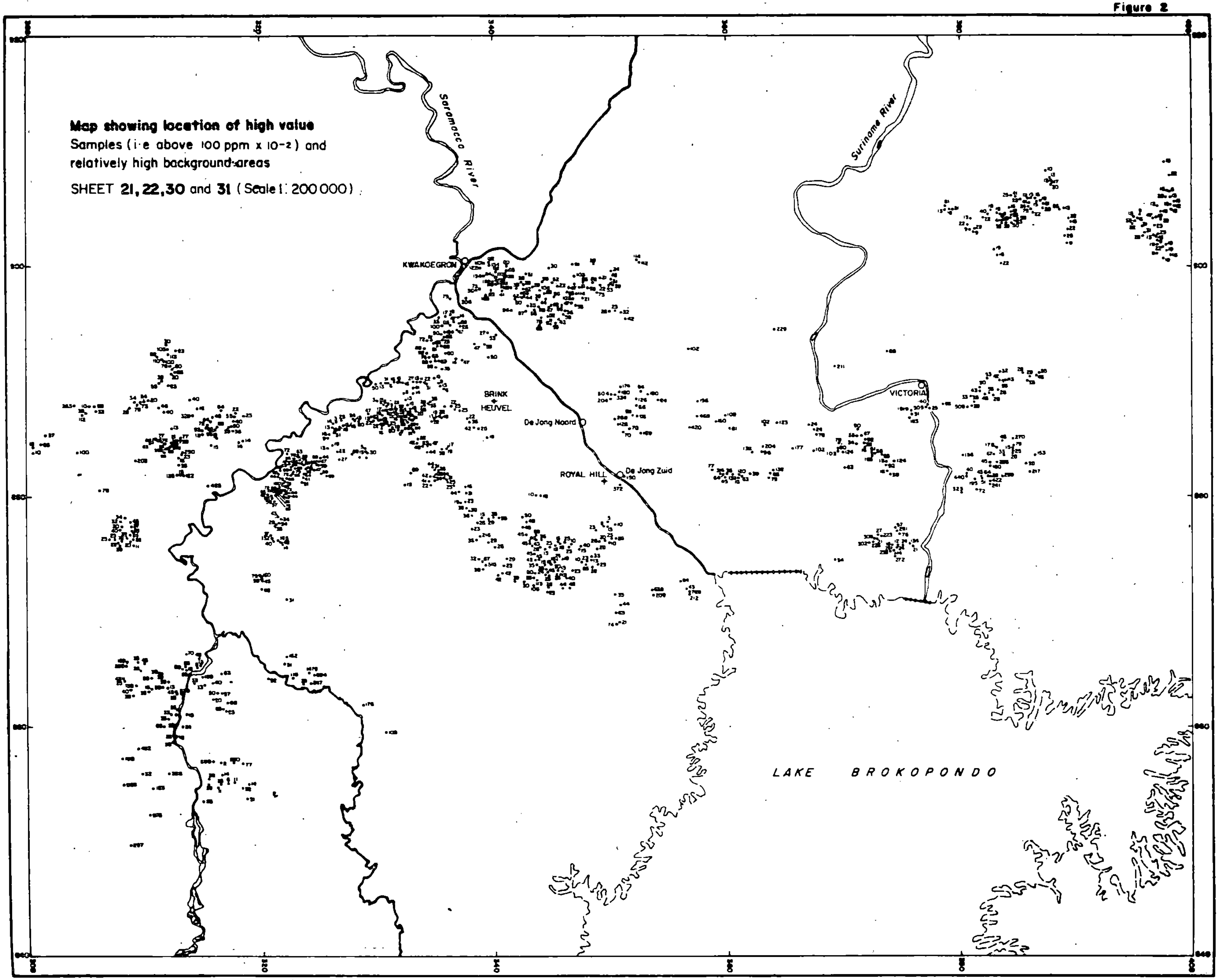

Sample location map (Streamsediment)
SHEET 21,22,30 and 31 (Scale 1: 200000)
ATLANTIC OCEAN
GUYANA
FRENCH-GUIANA
BRAZIL
Saramacca River
Suriname River
LAKE BROKOPONDO

Figure 2


Map showing location of high value
Samples (i·e above 100 ppm x 10-2) and
relatively high background areas
SHEET 21, 22, 30 and 31 (Scale 1: 200 000)
Saramacca River
Suriname River
KWAKOEGRON
BRINK HEUVEL
De Jong Noord
De Jong Zuid
ROYAL HILL
VICTORIA
LAKE BROKOPONDO

For the purpose of this study the first thing done was to display the location of each sample, which is to be found on map sheets on a scale of 1:40.000, on an overview map at a scale of 1:200.000, which incorporates the four mapsheets which cover the area of this study (Fig. 1). This proved to be very tedious, but control in sample location was afforded by the availability on an excellent topographic map in the scale of 1:200.000 (viz. C.B.L. Sheet 11). By a careful comparison of the topographic features surrounding the location of a sample point shown on the mapsheet on scale 1:40.000 with those shown on a scale of 1:200.000, very good correlation was possible in transferring these locations. The samples collected by den Hengst were mapped in a scale 1:100.000, but here again the presence of good topographic control enabled good correlation in transferring the data. It is noted that the stream sediment samples collected by den Hengst had not been previously analysed for gold, although they were done for several other elements. There were submitted for gold analysis by the author.

However, because of the long delay between their collection and submission for gold analysis, there were found to be several samples either missing or for which insufficient material was available for analysis.

At the time of writing of this report there are still some results for samples from sheet 21c and sheet 31b which are not available to the writer.

The next diagram prepared was fig. 2, which shows the distributions of relatively high value samples i.e. from 0.1 ppm to greater than 1 ppm. These high value samples are seen to form distinct clusters.

It is a well known fact that contouring of a discrete value map is a much more difficult exercise, than if the values have been averaged in some way, so as to reduce the influence of inherent geological variations as well as those due to possible sampling and analytical error.

For this study non-moving average values for cells of size 2,5 km x 2,5 km were calculated. An examination of the sample locations shown on the 1:40.000 maps referred to above, readily shows that these samples are irregularly spaced. Ideally the mean of their coordinates should have been computed and the mean values obtained for each cell plotted at this computed point.

However, as all computations were done employing a hand calculator, these mean coordinates were not computed, but instead all mean values were located at the centre of each cell. Moreover, an examination of the raw data maps (1:40.000) would again show that for some cells (the boundary lines for each mapsheet were used as the boundary in demarcating the cells thus for each 1:40.000 mapsheet there were 80 cells) there were less than five sample points on which the mean values were computed. Such values have been indicated with a question mark before the indicated mean value (fig. 3). In addition where relatively high mean values have been computed based on one or two very high values ("flyers") in a sea of relatively low values, such high values are also indicated with a question mark. Finally cells for which no data is available, are also indicated with a question mark. After plotting of the mean values the results were contoured (fig. 3).

Based on the result obtained in fig. 3, areas with mean values less than 0,2 ppm greater than 0,2 ppm but less than 1 ppm and greater than 1 ppm, have been demarcated (fig. 4). Several areas enclosed within the 0,2 ppm contour have been labelled by roman numerals I - IX and are discussed below (fig. 4).

INTERPRETATION OF THE RESULTS RELATED TO THE GEOLOGY

For a detailed description of the geology of the area covered by the mapsheets discussed in this report, the reader is referred to the reports on the geology of the individual sheets as well as the coloured Geological Map of Suriname (1:500.000).

Basically the area is underlain by part of granite-greenstone complex, which is known to outcrop in northeast and east Suriname. The greenstone complex turned the Marowijne Group (Bosma and Groenweg, 1973), has been subdivided as follows:

Armina and Rosebel Formation: Flysch-(Armina) and molasse-type (Rosebel) metasediments, including schists, phyllites, quartzites, graywackes, subgraywackes and conglomerates.

De Goeje Gabbro : Older gabbroic (and ultrabasic?) intrusives.

Paramaka Formation: Basic and acid extrusives and clastic and chemical metasediments, including: spilites, basalts and basic tuffs; rhyolites and dacites; and schists, phyllites and quartzites.

Into the rocks of the Marowijne Group, which have been folded and metamorphosed during the Trans-Amazonian Orogenic Cycle, have been intruded a series of granites, granodiorites and quartz diorites, with local leucogranites.

The author includes a geological map of Suriname (fig. 5) entitled "Simplified Geological Map of Suriname" by P. den Hengst, scale 1:1,000.000 (fig. 5). Shown in fig. 3 are the traces of a few fold axes mapped by Placer Development (1976) and by Schonberger and Maas of the G.M.D. (1977), because it is contended by the author that they are related to gold mineralization in the relevant areas.

Based on the contouring of the mean values calculated for each cell (fig. 3), nine areas with mean values greater than 0,2 ppm. have been demarcated (fig. 4). These areas are discussed below.

Figure 3

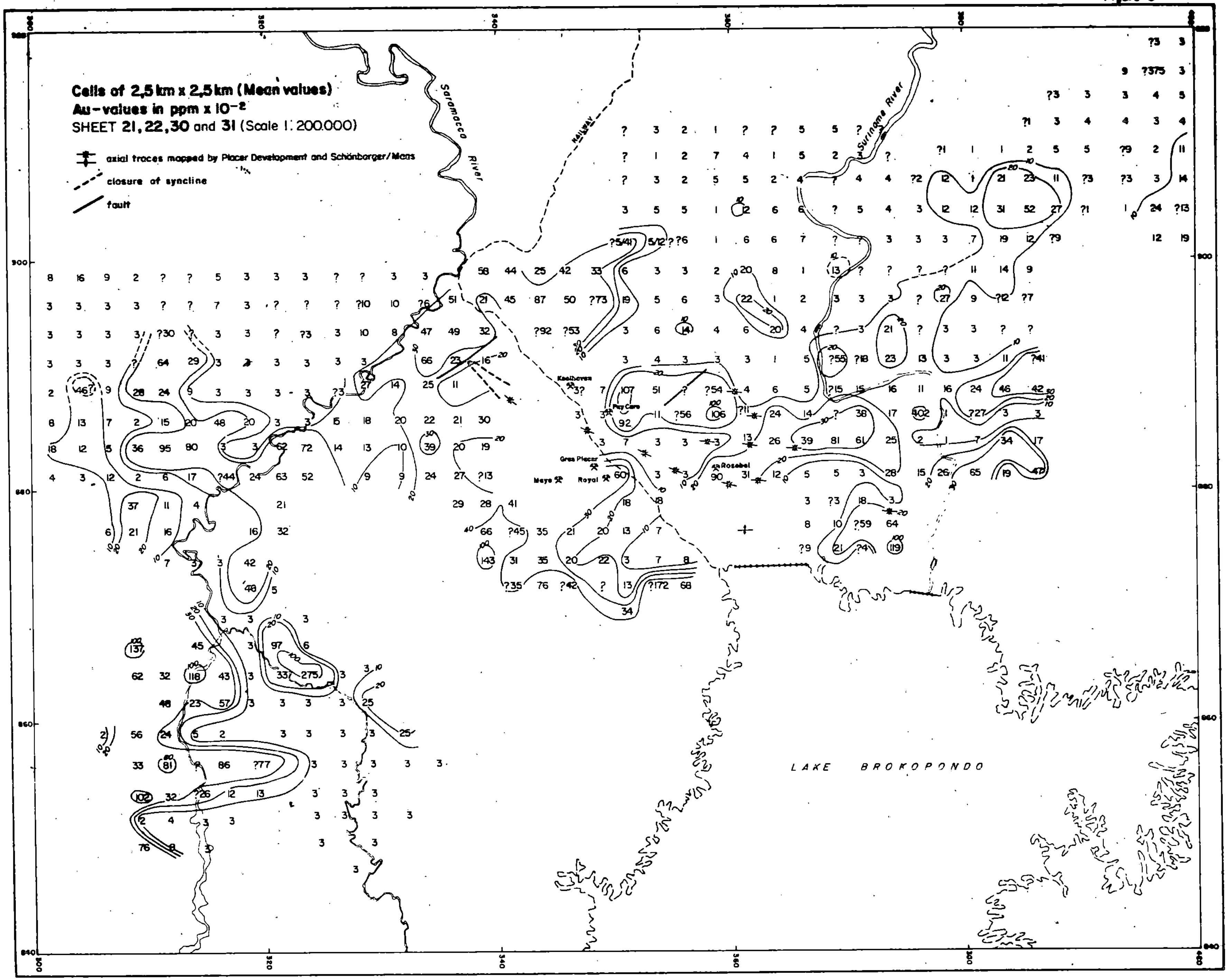
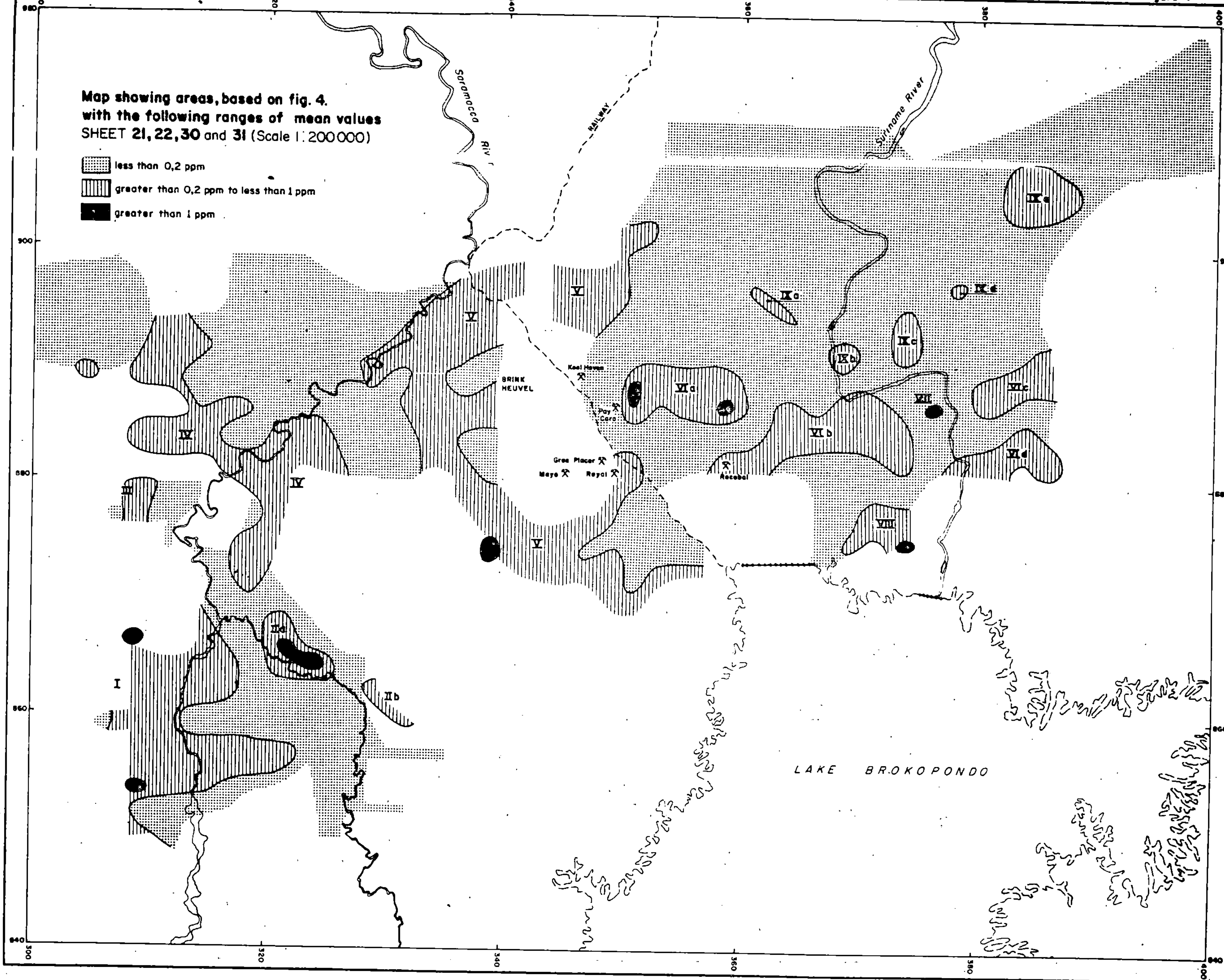

Cells of 2,5 km x 2,5 km (Mean values)
Au-values in ppm x 10^{-2}
SHEET 21, 22, 30 and 31 (Scale 1: 200.000)
axial traces mapped by Placer Development and Schönberger/Moes
closure of syncline
fault
Saramacca River
Suriname River
Railway
Koolhoven
Pay Caro
Gros Placer
Mayo
Royal
Rosebel
LAKE BROKOPONDO

Figure.4



Map showing areas, based on fig. 4.
with the following ranges of mean values
SHEET 21, 22, 30 and 31 (Scale 1 : 200000)
less than 0,2 ppm
greater than 0,2 ppm to less than 1 ppm
greater than 1 ppm
Saramacca Riv.
Suriname River
RAILWAY
BRINK HEUVEL
Keel Haven
Pay Caro
Gros Placer
Maye
Royal
Rocabel
LAKE BROKOPONDO
I
IIa
IIb
III
IV
V
VIa
VIb
VIc
VId
VII
VIII
IXa
IXb
IXc
IXe
300
320
340
360
380
400
840
860
880
900
920

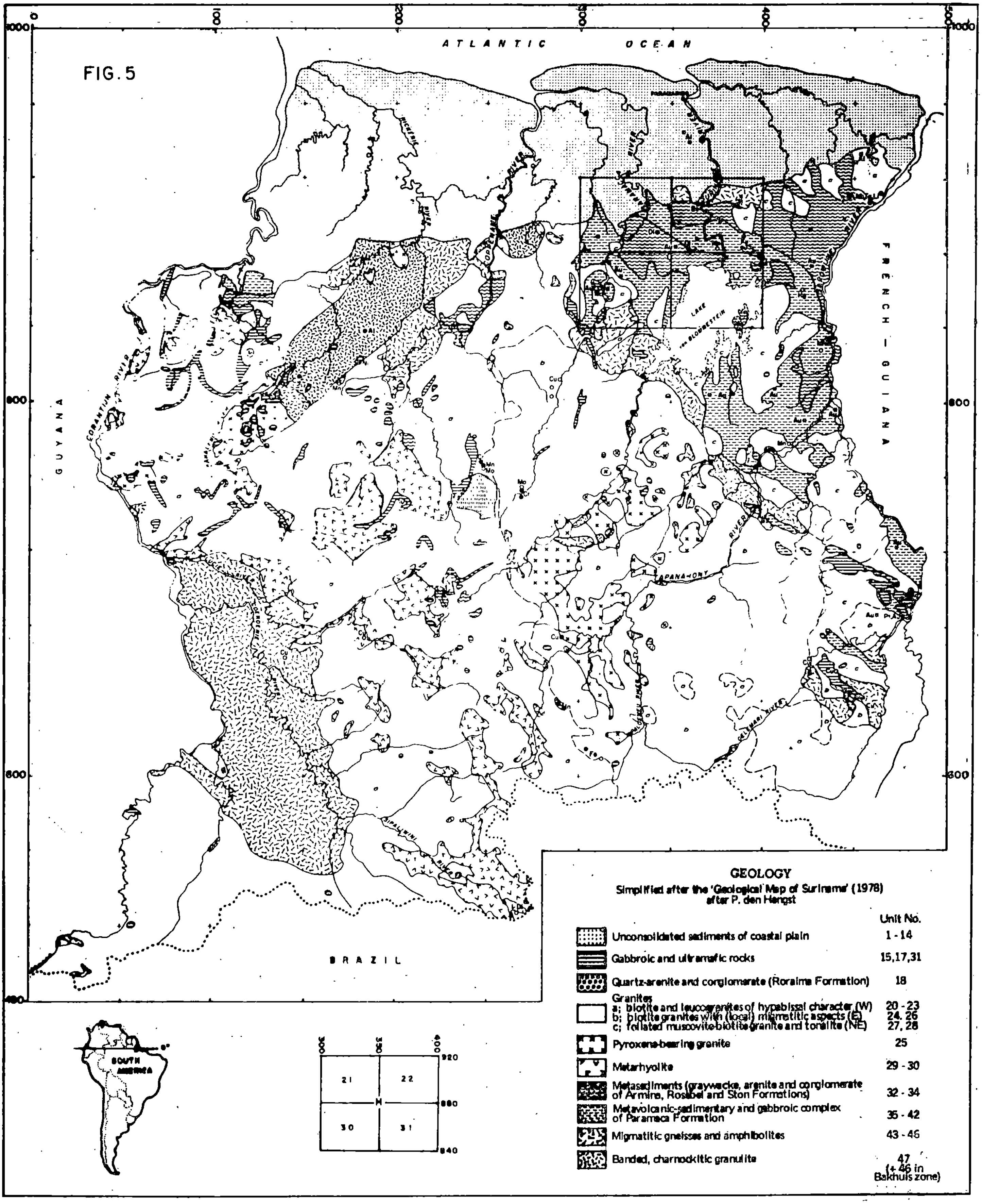


FIG. 5
ATLANTIC OCEAN
GUYANA
FRENCH - GUIANA
BRAZIL
COPPENAME RIVER
LAKE
APANA-HONT
SOUTH AMERICA
GEOLOGY
Simplified after the 'Geological Map of Suriname' (1978) after P. den Hengst
Unit No.
Unconsolidated sediments of coastal plain 1 - 14
Gabbroic and ultramafic rocks 15,17,31
Quartz-arenite and conglomerate (Roraima Formation) 18
Granites
a; biotite and leucogranites of hypabissal character (W) 20 - 23
b; biotite granites with (local) migmatitic aspects (E) 24, 26
c; foliated muscovite-biotite granite and tonalite (NE) 27, 28
Pyroxene-bearing granite 25
Metarhyolite 29 - 30
Metasediments (graywacke, arenite and conglomerate of Armina, Rosebel and Ston Formations) 32 - 34
Metavolcanic-sedimentary and gabbroic complex of Paramaca Formation 35 - 42
Migmatitic gneisses and amphibolites 43 - 46
Banded, charnockitic granulite 47 (+ 46 in Bakhuis zone)

AREA I

This is an extensive area that spans the Saramacca River from immediately above its confluence with the Kleine Saramacca to the north to the Pakkasiki creek to the south. There are two small zones with mean values greater than 1 ppm in the northwest and southwest sections of the area. According to the Geological Map., C.B.L. Sheet 30 (scale 1:100.000) by E. Veenstra, 1978, this area is underlain by tonalitic rocks, ultramafics, metavolcanics, metasediments and trondhjemitic to granodioritic. It would seem therefore that the mineralization is related to the intrusion of the granitic rocks (tonalite, trondhjemite to granodiorite) into the ultramafic complex, metavolcanics and the metasediments. The area remains open to the north and west.

AREA II

This area comprises two sections, designated a and b and is located more or less paralell to the WNW-trending section of the Kleine Saramacca before it joins the Saramacca River. Section a) straddles the Kleine Saramacca and is made up of a central portion with a mean value greater than 1 ppm surrounded by a lower value (0,2 - 1 ppm) halo zone which mimics the shape of the central portion. Section b) lies along strike of the elongation of section a) to the south-east. This latter section remains open to the northeast because of lack of sampling in this region.

Area II also lies in C.B.L. Sheet 30 and is underlain by metavolcanics and metasediments with intrusive trondhjemite to granodiorite (Veenstra op.cit). Therefore, as in Area I, it would seem that the mineralization is related to the granitic rocks which are intrusive into metavolcanics and metasediments.

AREA III

This area also lies in sheet 30. It is closed to the north but remains open to the south, due to a lack of analytical results of sampling which were collected by den Hengst but which were unavailable when they were resubmitted by the writer for gold analysis. Since it lies to the north of Area I, which itself remains open to the north, these two areas could well link up. The underlying rocks are metavolcanics and metasediments.

Although no granitic rocks are shown to be outcropping in the area, tonalite is known to occur closeby to the south of Area III. Once again the mineralization may be related to granitic intrusive.

AREA IV

This area lies on either side of the Saramacca River below its confluence with the Kleine Saramacca and remains open in the northwest and southeast. It represents another extensive area. The portion on the east bank of the Saramacca River lies in an area with granitic rocks outcropping to the northwest and south, while for the portion on the west bank granitic rocks are only known in the southeast section. Metavolcanic and metasediments underlie both portions of this area.

In Area IV we continue to see mineralization possibly related to granitic intrusion especially in the portion on the east bank of the Saramacca River. However, it is likely that the mineralization on the west bank of the River may be more in the nature of stratabound mineralization.

AREA V

This area is located on the right bank of the Saramacca River. It remains open to the north, south and in its east-central portion. In part it follows the closure of a major syncline mapped by Placer Development, 1976 (fig. 3, this report). A zone with mean values above 1 ppm occurs within it in the south and the Mayo, Gros Placer and Royal Hill deposits, investigated by Placer Development, lie within it in the southeast (figs. 3 and 4).

The area is underlain by metavolcanics and metasediments. It is noticeable that there is a lack of any known outcropping granitic intrusion in this extensive area, except for a small tonalite stock in the southeast. This would suggest to the writer that the mineralization in this area is of a stratabound nature as opposed to the suggested epigenetic mineralization for the four areas previously discussed.

AREA VI

This area comprises four sub-areas. Area VI (a) is entirely enclosed, whereas area (b) remains open to the south-west area (c) to the east and area (d) to the south-west. Area (a) has two zones with mean values greater than 1 ppm in its extreme eastern and western sections respectively.

The area is underlain by metavolcanics and metasediments. Granitic rocks are conspicuous by their absence. However, Brinck (1955) postulates the presence at depth, of granitic rocks in part of this area, because of the occurrence of contact metasomatic phenomena.

It is to be noted that the elongation of the various sub-areas is parallel or sub-parallel to the trend of the major synclinal axial trace, as well as, several minor synclinal axial traces mapped by Placer Development and shown in fig. 3. Though no anticlinal axial trace are shown by Placer, the writer contends that these should exist, unless sheared out. In fact, one of the minor axial trace shown as synclinal on Placer's map is really anticlinal, judging from the direction of closure of the beds, as mapped by Placer. In fig. 3 this axial trace is again indicated as synclinal (according to Placer), but shown with a question mark. Schonberger and Maas (1977) have mapped the trace of an anticlinal axis to the east of Weg Brownsweg-Berg en Dal, which lies to the south of the synclinal axial trace.

This anti-clinal axial trace is also shown in fig. 3. The close correspondence of the trends of the elongation of the four sub-areas of Area VI with those of the axial traces and the lack of granitic rocks outcropping in the area, suggest that the mineralization is stratabound in nature.

AREA VII

This is a small zone, which has the highest computed mean value, i.e. greater than 4 ppm. It is located in the Victoria area on the west bank of the Suriname River. It may well be related to the Area VI, but it is treated separately here, because it is supposed to be related to a river terrace deposit and also because it is found in an area that forms part of an oil-palm plantation. This latter fact may rule it out for further exploration.

AREA VIII

This area is located to the south of Area VI and is open to the east and south-east. It contains a zone with mean values greater than 1 ppm in the south-east. The trace of a synclinal axis, mapped by Schonberger and Maas (op cit) and which is most probably the eastward extension of the major synclinal axis shown by Placer, is located in the northeast of this area (fig. 3). A projection of the anti-clinal axial trace, mapped by Schonberger and Maas, eastward along strike, would pass through the centre of the area.

The area is underlain by metavolcanics and there is no known granitic rocks outcropping. Here again it is suggested that mineralization is stratabound in nature.

AREA IX

The five zones to the north of the sub-areas designated VI are grouped together as Area IX. All these zones are closed. The four relatively small zones to the south are in metavolcanics and metasediments. The largest zone to the northeast is related to a biotite-granite intrusive into metavolcanic and metasediments.

Hence the four southern zones may represent stratabound mineralization, while the northeastern zone may represent epigenetic mineralization.

RELATION OF GOLD AREAS TO OTHER GEOCHEMICAL DATA

There is available data for several other elements e.g. Cu, Ni, Cr, Co, Zn for each of the sample points shown in fig. 1. The author has not attempted to treat the data for the individual element as has been done for the gold data. However, contour maps based on moving average values on cells of 4 km by 4 km are usually prepared by the individual geologist and these maps should be available shortly. The author has done a preliminary analysis of the available data and has found the following.

There is some coincidence between the gold areas demarcated for this report and the other elements, especially Cu, Ni, and Zn. However, in the main, the distribution of these elements tend to reflect the underlying geology being generally higher in the Paramaka Group of rocks and lower in the Armina and Rosebel rocks. For instance, in sheets 22a, b, which area is underlain by Armina and Rosebel rocks, the overwhelming majority of values for all the elements analysed are below 10 ppm. In sheet 21d, which cover part of Area V, all the elements show higher average values, eg. Cu 30 ppm, Zn 30, Ni 20, Co 15, Cr 40 in the northeast quadrant where the area is underlain by Paramaka rocks than they do in quadrant eg. Cu 10, Zn 10, Ni 10, Co less than 10, Cr 15 where the area is underlain by Armina and Rosebel rocks.

SUMMARY AND CONCLUSIONS

The areas located in the Saramacca River-Kleine Saramacca region (I, II, III, fig 4) are closely associated with granitic rocks which are intrusive into ultramafics (Area I), metavolcanics and metasediments. This would suggest that the mineralization in these areas is mainly of the epigenetic type related to the contact regions of the granitic intrusions. However, the possibility of stratabound mineralization cannot be ruled out.

Area IV is another area where the mineralization seems to be related to granitic intrusives, at least in the south-eastern portion. The north-western portion of area IV does not show any relationship to known granitic rocks and here the mineralization may be stratabound in nature. Area IXe is another area where the mineralization appears to be related to a granitic intrusion. However, here we have a biotite-granite instead of the trondhjemitic to tonalitic rocks of the Saramacca region intrusive into metasediments and metavolcanics.

The areas located in the Mindrinetti-Brownsweg-Suriname River (Areas V to VIII and IX a tod, fig.4) do not show any obvious association with granitic rocks. In fact, except for a small tonalite body which outcrops in the vicinity of Km 109 along the old railway in the south-east section of Area V, there is no known granitic body in this region. However, based on the presence of contact metasomatic phenomena, Brinck (op cit) postulated that granitic rocks may occur at depth in De Jong Noord-De Jong Zuid region.

On the other hand, the various zones of Areas VI and VII are elongated in a direction parallel or sub-parallel to the trends of the axial traces of folds in the region. Area V, which lies partly in Paramakka rocks and largely in Armina and Rosebel rocks, tends in part to follow the closure of a major syncline mapped in the Mindrinetti area (fig. 3). Moreover, Placer Development (op cit) found at Royal Hill (Area V) "one large phonolite flow or possibly a close spaced series of phonolite flows making up the bulk of the mineralized rock". All of these facts point to the likelihood of the presence of mainly stratabound mineralization in this region. Epigenetic mineralization in quartz veins has also been reported from the Royal Hill area (Placer Development) and Guyana Gold Placer and De Jong Noord (Brinck) in this region.

The seeming co-occurrence of stratabound and epigenetic (related either to metamorphic reworking or granitic intrusions) mineralization should not be surprising; as it is being increasingly realized from a re-study of old gold producing areas that these two types of mineralization frequently occur together in granite-greenstone terrains Karvinen (1980) in proposing a syngenetic-epigenetic origin, rather than a purely epigenetic origin, for the gold mineralization in the Timmins Area, Ontario, states: "gold was initially deposited into a variety of ocean floor and vent environments during a submarine calc-alkalic felsic volcanism and exhalative activity, further distribution and concentration of gold into structurally favourable zones (eg. dilatent fractures) ocurred during regional metamorphism and deformation".

A similar model may well be applicable for the mineralization in the Mindrinetti-Brownsweg Suriname River region. In addition, it has usually been found that mineralization produced by the remobilization of disseminated mineralization and its reconcentration in shear zones and other fractures within the margins of granitic intrusives and country rocks tends to be higher grade, though more erratic than stratabound mineralization. Such a situation seems to obtain in the areas that form the subject of this report, for, in terms of alluvial gold production, the Saramacca River-Kleine Saramacca region has proved to be more productive that the Mindrinetti-Brownsweg-Suriname River region.

It is noteworthy that four of the deposits investigated by Placer Development (op cit) viz Mayo, Gros Placer, Royal and Rosebel (fig. 3, 4) lie within areas with mean values greater than 0,2 ppm. One such deposit, Pay Caro, lies just outside the western limit of area VIa, while another, Koolhoven, lies within an area whose mean value of less than 0.2 ppm is questionable. This fact would indicate that all the areas known in fig. 4 represent target areas warranting more detailed investigation - detailed stream sediment sampling followed by soil sampling coupled with detailed mapping. Such investigations must be planned bearing in mind the distribution of values in relation to topography and underlying geology and coupled with a study of the available aero-magnetic-electromagnetic and radiometric data.

Perhaps priority areas may be selected after more rigorous statistical treatment of the data, but a good starting point could be the selection of areas, which enclose zones with mean values greater than 1 ppm.

Based on what has been written before, it can be concluded:

i) That the analysis for gold (and other elements) in stream sediment samples collected during a reconnaissance geochemical sampling program has confirmed the presence of a "gold province" in the areas which are discussed in this report. The presence of gold mineralization has already been known from hundreds of sucessful, mainly small scale, alluvial gold working and a few not so successful attempts at mining of quartz veins, the latter especially in the Mindrinetti-Brownsweg-Suriname River region.

ii) Statistical treatment of the geochemical data and contouring of the reduced data demarcated several zones, which warrant detailed follow-up exploration. Moreso, especially since four of the deposits investigated by Placer Development and whose reserves may be placed in the probable category fall within two of the demarcated zones.

iii) Relating the demarcated zones to what is at present known of the underlying geology would seem to indicate that there is present both epigenetic and stratabound gold mineralization.

iv) Reconnaissance type stream sediment geochemical sampling should be continued, in order to provide information to enable closing of the several zones that remain open because of the present lack of data.

v) Detailed geochemical follow-up investigations of the demarcated areas and exploration of those that give results warranting such activities, may very well disclose the presence of mineralization other than gold eg. Cu, Ni, for there are also anomalous showings of other elements in the samples collected during the reconnaissance survey.

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