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THE OIL FIELDS OF GEORGIA.  
( THE GRUZEFT ).

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THE OIL FIELDS OF GEORGIA.( THE GRUZNIFT ).I. INTRODUCTION.

Georgia is bordered by the Krasnodar territory, Stavropol region, Kabarda, North-Osetia, and Grozny region in the North; the Dagestan autonomous republic and the Azerbaijan S. S.R. in the East and the South-East, <sup>Armenia</sup> Armenia and Turkey in the South, whereas in the West her frontiers are limited by the Black Sea.

With a total area of about 64,000 square kilometers, the S.S.R. of Georgia has a population of over 2,800,000, including the Abhazi and Adjari autonomous republics and the South-Osetian autonomous region, which are comprised within the limits of Georgian republic.

Subtropical <sup>climatic</sup> climatic conditions of Georgia enabled the Soviets to develop to a considerable extent tea plantations (over 55,000 hectares), vineyards, orange, tangerine and lemon growing, and tobacco culture (20,000 tons per year). A further extension of these plantations is expected in the immediate future. In addition, <sup>maize</sup> maize, wheat, <sup>sugar-beet</sup> sugar-beet, cotton and a number of <sup>oleaginous</sup> oleaginous plants, such as eucalyptus, campher-tree, ramie, tung, etc., are cultivated in the country.

Industrial production has also much increased in Georgia since the last fifteen years. Thus, for instance, a new centre of steel industry was recently created at Rustavi, located at a distance of only 12 kilometers to the South-East of Tbilisi, the capital of the republic. The output of the Rustavi works includes: steel, rolled steel, pig iron, etc., and the iron ore is supplied by the Dashkesan mines, situated in the adjacent Azerbaijan. Mining industry is represented in Georgia by the well-known Chiaturi manganese mines (about 2,000,000 tons of manganese ore per year), and the Tkvarcheli and Tkvibuli collieries (with a total annual output of approximately 2,500,000 tons of coal for both districts). The exploitation of Tkvarcheli and Tkvibuli collieries is being intensified by the "Grusugol combinat" (Georgian Coal Corporation) since the end of the war, while the development of the manganese ore production is also being carried out at Chiaturi, the second, after Nikopol, manganese area in the U.S.S.R.

Four powerful hydroelectric plants and a number of small power stations, with a total capacity of 190,500 kwts, had been erected in Georgia between 1946 and 1951. Among these, Rion-Ges and Hram-Ges, constructed on the Rion river and Hram river, respectively, are the most important (See the map hereto attached).

Mechanical construction industry, cement, chemical, textile paper, pulp, as well as other branches of light industry, such as fruit preserves, wines, brandy, etc. continue to increase their output. A new automobile plant has been recently completed at Kutaisi, the second city of Georgia, with an initial annual output capacity of 15,000 cars. Kutaisi is also a centre of textile (silk, wool and clothing) industry.

At Tbilisi, footwear, leather, textile mills, and clothing manufacturing factories have been created. A number of other goods, such as sugar, grain oil, meat and butter, are produced in large quantities in Georgian republic.

Draining of the Kolhida swamps led to the extension of cultivated surfaces over newly recovered areas of arable land. The irrigation of the Samgor plain by means of the Iori river waters was undertaken since 1948. The creation of a network of small hydroelectric plants permitted to supply country districts of Georgia with cheap power and electric light.

Last but not least, Georgia possesses an oil industry, which comprises the Batum refineries, linked with Baku by channel of three main pipe-lines, and exploited by The Asneft refining department (The Asneftepererabotka); small refineries at Tbilisi and Mirzaani, operating on Georgian crude, as well as a number of small exploited oil fields situated in various regions of the republic ( in Guria, Tiflis district, and Kahetia).

The oil fields of Georgia are controlled by The Grusneft (Georgian oil) trust, which was organised in 1930, and which has taken over investigations for petroleum in a number of exploration areas of Georgia. Until July 1939, The Grusneft had been comprised into the network of the Asneftedobycha organisation (Azerbaijan Oil Production); since that date, however, it received a complete autonomy of its activities. This reorganisation was carried out in the anticipation of a rapid growth of crude production of the Grusneft, following the discovery of new oil bearing areas of Norio-Martkobi and Subsa-Ompareti. The earlier hopes regarding the prolific<sup>carry</sup> of these areas were not justified, however, by the further exploitation, and these fields remained

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ever since oil producing areas only of a minor importance. The Gruzneft continues to operate as a separate Soviet oil trust, and this despite its very limited crude production, which at the present time is of an order of 120,000 tons per year.

In addition to the small exploited oil fields, which will be briefly described in the next paragraph, there exist in Georgia a considerable number of exploration areas spread over large territories almost in everyone of her provinces. The progress of exploration work in various regions of Georgia will be examined in the chapter III of the present report. In order to facilitate the study of investigations for petroleum of the Gruzneft, a map of The Oil Fields of Georgia will be found here-to attached.

## II. PRODUCTION.

Crude oil is being produced now in the following small fields of The Gruzneft: 1. Mirzaani; 2. Shiraki; 3. Norio-Martkobi; and 4. Subsa-Ompareti. First commercial quantities of oil were obtained at Mirzaani in 1931, whereas rudimentary production was known at Shiraki since 1869, Norio-Martkobi was discovered late in 1938 and put on regular production in 1940, and, finally Subsa-Ompareti was brought into production in 1940.

All these small oil fields yield, so far, but a very limited production, their average daily yields varying between 2 and 5 tons per well.

The production situation developed in the fields of The Gruzneft as follows:

### CRUDE OIL PRODUCTION OF GEORGIA.

<u>Year.</u>	-	<u>Metric Tons.</u>
1931	-	1,700
1932	-	4,000
1933	-	5,300
1934	-	6,100
1935	-	7,200
1936	-	8,000
1937	-	25,000
1938	-	46,000
1939	-	61,000
1940	-	82,500
1950	-	110,000

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With the increase of crude production at Mirzaani and Shiraki, the capacity of a small refinery located at Mirzaani became insufficient to treat all the crude available, and to remedy this situation a 68 kilometers long pipe-line has been laid by the end of 1940 between Shiraki and Kachreti. The ~~in-~~ ~~take~~ capacity of the Mirzaani refinery has been increased up to 500 tons in 1940, in order to treat the whole of crude obtained at Mirzaani and Shiraki, while small quantities of crude oil produced in the Subsa-Ompareti area are being refined at Batumi.

Following the discovery of new oil fields at Morio-Martkobi and Subsa-Ompareti and a considerable increase of yields at Mirzaani and Shiraki, a rapid development of the Gruzneft crude production was expected for the period 1941-1945. But, the outbreak of the war, on the one hand, and a very slow progress of drilling operations and poor average yields in Georgian fields, on the other hand, were responsible for the fact, that crude production increased in Georgia only on a very limited scale since 1941 (110,000 tons in 1950, as against 82,500 tons in 1940). A summary on the exploited fields of The Gruzneft can be found below.

#### 1. Mirzaani oil field.

Mirzaani is located at a distance of about 110 kilometers to the South-East of Tbilisi. Surface oil seepages and crude production by means of rudimentary methods were known in this area since a very long time. A few shallow wells were drilled here as early as 1870. Deep test drilling was started at Mirzaani in 1927 , but no definite results were obtained and drilling operations were discontinued at a depth of 540 meters.

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Exploration work was resumed by The Gruzneft in 1930. A number of test wells were completed in this area between 1931 and 1936, when contour drilling was achieved around an oilbearing area of 350 hectares. 18 wells were drilled in 1931; 26 - in 1932; 40 - in 1933; 47 - in 1934; 16 - in 1936 (Nos. 14, 17, 18, 21, 33, 38, 40, 41, 42, 44, 52, 54, 55, 56, 60, and 86). Wells Nos. 18, 40 and 41 have been put on regular production in 1937. Average yields of producing wells at Mirzaani varied between 3 and 5 tons per day and per well.

Nine new wells had been completed here in 1939, when the exploited area of Mirzaani reached about 150 hectares. An extension of this area up to 400 or 500 hectares was expected for 1941, but the beginning of the war ~~has~~ stopped test drilling operations of The Gruzneft. Exploration work was resumed at Mirzaani since 1946, but no new discoveries of any particular interest were reported from this field, and Mirzaani still remains a small oil producing area of a local importance.

## 2. Malyia Shiraki.

This field is situated in about 15 kilometers to the South-East of Mirzaani (See the Map of The Oil Fields of Georgia attached to the present report). The Malyia Shiraki valley is surrounded by mountains and the area is formed of Upper Pliocene (Akchaghyl and Apsheronian) deposits and of Upper Miocene (Shirakian) strata. The Shiraki structure is a monoclinial fold, complicated by an overthrust. Shirakian stage of the Upper Miocene Series is oilbearing in this field. Eight oilbearing horizons had been discovered by the wells which were completed at Shiraki; their general thickness reaches 43 meters. Horizon IV strikes at a depth of 295 meters; horizon V - 27 meters thick - at a depth of 366 meters. Well No.18 gave oil from horizon V, while well No.44 yielded a small oil flow from horizon IV. Oil indications were also encountered in horizons VII and VIII. Oil shows were also obtained in the outcropping Sarmatian formations (Upper Miocene).

Small rudimentary crude production by means of pits and shafts was known at Malyia Shiraki since 1869. Between 1872 and 1877 about 180 shallow wells, which were, generally, drilled to an average depth of only 60 meters, had yielded a cumulative production of about 20,000 tons. Since 1932 the exploitation of Malyia Shiraki area was resumed by The Gruzneft. Up to 45 wells had been completed in this field between 1933 and 1940. Some of the wells drilled at Malyia Shiraki in 1938 and 1939 to horizon VIII and lower lying layers (wells No.2, 3, etc.) gave initial flowing production of 20 to 30 tons per day and per well. Twenty one new wells were brought into production in 1940, when the yields of this field increased to a considerable extent. In spite of the efforts



made by the Soviet technicians, in order to develop this small field, no new achievements took place at Shiraki, which continued to yield a small production. Since 1940 the Malyia-Shiraki oil field is linked with the railroad by means of a 68 kilometers long pipe-line.

### 3. Norio-Martkobi.

The Norio oil field <sup>lies</sup> ~~is lying~~ at a distance of 24 kilometers in <sup>a</sup> North-Eastern direction <sup>from</sup> ~~of~~ the city of Tbilisi. A large anticline, striking to the South and broken by an over-throw has been discovered at Martkobi - area located in the immediate vicinity of Norio - in 1934 by means of geological methods. The Southern overthrust flank of the Martkobi structure is formed by the Lower Oligocene deposits, whereas Upper Oligocene and Middle Miocene (Maikopian) formations are also encountered in this structure. Surface oil seepages were discovered in Maikopian strata.

Following, the geological research work, shallow test drilling was started at Norio-Martkobi in 1936. First satisfactory results were obtained, however, only in September 1938, when test well No. 16, drilled in the Norio area to a depth of 284 meters, gave an oil flow; the initial daily yield of this well reached up to 120 tons of light oil. Four other wells were spudded in here in 1938. Some of these testwells yielded in 1939 and 1940 an average initial daily flowing production of an order of 80 tons per well. The Norio oil field has been brought into production late in 1939, but its further development was much delayed due to the very slow progress of road building and frequent drilling accidents.

Since the end of the war, deep exploitation drilling was undertaken at Norio-Martkobi; thus, for instance, a few wells were completed in 1948 and 1949 to an average depth of 900 meters. Test drilling was also continued to Sarmatian deposits (Upper Miocene Series), and oil indications were encountered in these formations. Initial yields of new wells varied between 20 and 30 tons per day ~~and~~ per well, but when brought into production, these wells <sup>have</sup> a daily stabilised production of only from 2 to 5 tons per well. Notwithstanding its proximity to Tbilisi, Norio field, so far, could not be developed into an important . . .

oil producing area, <sup>which is</sup> what was particularly due to its poor per well yields.

#### 4. Subsa-Ompareti fields.

Subsa oil area is located ~~at~~ 50 kilometers to the North of the port of Batumi and ~~at~~ 18 kilometers to the South of Poti, in the vicinity of the Ompareti oil field. Geological research work, which was carried out in this area during 1938, led to the organisation of test drilling. Test well No.41 yielded first oil flow in this area; well No.3, completed at Subsa late in 1938, gave an initial yield of 50 tons of oil per day. A number of other wells, drilled here between 1939 and 1941, gave smaller initial yields.

At Ompareti, situated in the immediate vicinity of the railway line linking Tbilisi to Batumi and at an approximate distance of 50 kilometers to the North-East of this last town, geological investigations and test drilling were started in 1935, but no positive results were obtained in this area until 1938, when an oilbearing horizon has been drilled by a test well, which gave from a depth of 196 meters an initial yield of between 25 and 30 tons per day.

The Subsa-Ompareti oil fields were put on regular production in 1940. Earlier hopes as to the possibility of developing an industrial production in this area, were not, however, quite justified, and the average yield of Subsa-Ompareti remained at a moderate level.

Summing up, up to the present, the crude production of The Griseft bears a purely local character, and it did not develop much during the last ten years. The bulk of this production is being yielded by two small oil fields: a. Mirsaani, and b. Shiraki, whereas Norio-Martkobi and Subsa-Ompareti fields give only a small production.

### III. EXPLORATION AREAS OF GEORGIA.

#### A. Regional Geology.

The geology of this vast territory comprised between the Main Caucasus mountain chain and the Lesser Caucasus ridge, and thus adjacent to the Southern edge of the Caucasus geosyncline, is characterized by an extremely complicated tectonic structure. The mountain-making movements of the early Miocene period . . .

are at the origin of the <sup>metamorphosis</sup> metamorphosis of this region into a mountain area, which was subsequently denuded. Along the axis of the Main Caucasus various series of sedimentary strata are striking parallel to the line of the uplift. The sediments are metamorphosed near the central mountain core. Jurassic formations are followed by Cretaceous and Tertiary deposits thus, Tertiary strata are encountered along the southern side of the geosyncline. Apparently, the substrata of the Caucasian geosyncline have been subdivided by successive fractures into separate zones, which, in their turn, were subjected to movements of different power and direction. These movements were, presumably, followed by regressions and subsequent transgressions of the sea. A powerful thickness of Terrigenous and volcanogenetic sediments accumulated in this geosyncline during Eocene and Oligocene, whereas numerous folds were formed in these strata during Miocene and Pliocene periods. A great variety of lithological composition of Tertiary formations is observed in this region; these deposits mainly consist of layers of sandstones, shales, conglomerates, tuffs and breccias.

#### B. Stratigraphy.

The stratigraphical section of the exploration areas of Georgia has been briefly summarized in the Stratigraphical table hereto attached. Tertiary strata are well represented in the plains of Georgia, with the exception of the Upper, and especially Middle Pliocene Series, the last ones being absent in almost all exploration areas of this region. As far as can be ascertained at the present time, Cretaceous and Jurassic deposits are predominant in the mountain areas. The problem of the origin of Georgian oil could not, so far, be solved by the Soviet geologists, whereas some of them believe Georgian oil to be of Lias origin and explain its discovery in more recent formations (Oligocene and Miocene, for instance), as a result of migration from Jurassic sediments, others seem to be inclined to contest the secondary origin of oil accumulations which are encountered in Tertiary deposits.

Among various reservoir rocks discovered in Georgia should be particularly mentioned the following: -

a.: Upper Miocene Series (Shirakian and Sarmatian stages).

b.

Shirakian stage is oil producing in South-Eastern Kahetia (Mirsaani and Shiraki oil fields), as well as at Norio-Martkobi, whereas Sarmatian Series are developed in the most part of the exploration areas of Georgia; they are oilbearing in Guria (Subsa-Ompareti fields), and oil indications were encountered in this stage in Imeretia and Kahetia).

b/. Middle Miocene Series ( Karagandian & Chokrakian).

These formations also proved to be oilbearing in Guria, whereas oil indications of varying importance were met in Middle Miocene Series in Imeretia, South-Osetia and Kahetia. Chokrakian-Spirialis stage seems to be of a particular interest.

c/. Lower Miocene & Upper Oligocene Series (Maikopian).

Maikopian Series form the oilbearing thickness of Norio-Martkobi area (Kahetia); some oil indications were also encountered in these deposits in the South of Kahetia and in South-Osetia.

d/. Lower Oligocene (Konsky stage).

Oil indications were found in Konsky formations in different parts of Georgia, namely: South-Osetia, Kahetia and South-Eastern Kahetia.

e/. Upper Cretaceous Series (Danian & Senonian).

In these formations, well developed in the province of Imeretia and partly absent in South-Osetia, some oil indications were encountered in Senonian and Turonian stages.

f/. Upper Jurassic (Tithonian, Oxfordian & Callovian).

Oil indications were discovered in these deposits in the flanks of the Tsona structure (South-Osetia); the Jurassic system was not yet tested in Guria, Imeretia and Kahetia.

g/. Middle Jurassic (Baicocian-Porphyrific) Series.

Porphyritic sediments are well represented in the Tsona zone of South-Osetia, where they are oilbearing, whereas in the most part of other provinces of Georgia these formations were not as yet tested.

h/. Lower Jurassic (Lias) Series.

With the exception of the South-Osetia, where Lias deposits are being explored, and some oil indications were discovered in these formations, the Lower Jurassic Series were not, so far, tested in the exploration areas of the Grusneft.

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### C. Tectonics.

Considerable number of anticlinal uplifts are encountered in Georgia, and these can be classified by the degree of their uplift into two following groups: a. Low angle gently sloping anticlines and b. Medium high overthrust anticlines. Tectonic structure of these folds is, generally, very complicated and has, so far, not been sufficiently studied to enable us to present any generalized picture of this region, so that we have to limit ourselves to a brief description of various isolated areas, where research work has been carried out up to the present.

Oil accumulations are being, generally, encountered in anticlinal structures, in the zone of unconformities. These structures, the tectonics of which is much complicated by the existence of various faults and overthrusts, strike, in the most part of the cases, from North-West to South-East.

In order to facilitate the study of various exploration areas of the Gruzneft, we shall examine them, successively, from West to East, with the help of the map attached to the present report. To the group of Western areas belong the structures situated in the provinces of Guria, Abkhazia, followed by those of Iveretia, South-Osetia, Rachi, and Kahetia. The exploration areas located in South and East-Kahetia are adjacent to those of Azerbaijan, which have been already described in an earlier report.

#### A. THE EXPLORATION AREAS OF GURIA.

Geological investigations were started by the Soviets in 1926 in a number of exploration areas situated in the province of Guria. After a few years of research work, however, these operations were discontinued to be resumed only in 1936. Several interesting structures had been discovered since in Guria, where oil indications of varying importance were encountered. Among these structures can be particularly mentioned;: The Trialety ridge and the Adjari-Imereti mountain chain, which extends in almost a latitudinal direction from West to East, for more than 250 kilometers, between the Black-Sea coast and the Tbilis area in the East.

The exploration areas lying on the Black-Sea coast seem to be of a particular interest, due to frequent surface oil

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seepages, known in this general area. Geological conditions make the task of explorers very ungrateful. In view of an insufficient study of various oil areas of Guria, there exist a variety of opinions regarding the tectonic structure and the origin of oil in this region. Oil seepages are being encountered all along the Trialety ridge. Oil indications, generally, correspond here to Upper Miocene (Sarmatian) Series, and Middle Miocene (Chokrakian-Spirialis) deposits.

In addition to geological research work, test drilling was organized in Guria, and was carried out for a number of years before the war. First positive results were obtained in 1938; when a few test wells yielded oil in industrial quantities at Ompareti and Subea.

A summary description of the exploration work, which is being continued in different areas of Guria, is given below:

#### 1. Notabeni.

This exploration area is located in a few kilometers from the railway station bearing the same name, and at a distance of about 50 kilometers to the North-East of the town of Batumi. Geological research work was started at Notabeni, where natural oil seepages were known since a long time, and test drilling was undertaken in this area, following the discovery of oil in commercial quantities at Ompareti. Although, up to the present, no definite results were obtained, investigations for petroleum are being continued at Notabeni.

#### 2. Shromis-Temi.

At Shromis-Temi, located ~~in~~ about 15 kilometers to the North of Notabeni, an anticlinal uplift was discovered. This anticline is formed by Upper Miocene (Sarmatian) Series and Middle Miocene (Chokrakian Spirialis) deposits, whereas in its Eastern flank Lower Miocene and Upper Oligocene (Maikopian) formations are encountered. The structure is overlapped by a secondary folding and is characterized by extremely complicated tectonics. Geological research work is being carried out in this area and test drilling was also started at Shromis-Temi, but so far, no discoveries were reported.

#### 3. Guliani.

Geological exploration work was organized at Guliani, situated at a distance of about 6 kilometers in the North-Eastern direction of Notabeni station. Surface oil seepages

were known to exist in this area for a long time. No definite results were obtained, for the time being, at Guliani.

#### P. THE EXPLORATION AREAS OF IMERETIA.

Exploration areas belonging to this region are mostly lying in the central part of Imeretia, limited by the Zhenis Zhali river - in the North-West; Svanetia and South-Osetia, in the North; Tbilisi province, in the East, and Adjari-Imereti ridge, in the South.

Oil seepages were encountered in Imeretia in Tertiary and Cretaceous deposits; it is believed, however, that oil shows found in Senonian and Turonian stages of Upper Cretaceous Series are of a secondary origin. Oil indications met in Tertiary deposits are limited in this province to Middle-Miocene (Chokrakian-Spirialis) Series. In spite of the fact that oil seepages were known in Imeretia already in 1885, and geological investigations were carried out in this region for a number of years, no deep test drilling was undertaken in Imeretia until ~~the thirties~~ <sup>the thirties</sup>.

Amongst the exploration areas of Imeretia considered by the Soviet geologists to be of certain interest can be mentioned the following:

##### 1. Bagdadi.

This area is located at about 30 kilometers to the South-East of the town of Kutaisi. Surface oil shows have been discovered at Bagdadi about fifty years ago, and they seem to be of a particular interest. Geological investigations were periodically started, discontinued and resumed in the province of Kutaisi. No positive results were, so far, obtained at Bagdadi.

##### 2. Parzhali.

Parzhali exploration area <sup>is</sup> lying at a distance of 25 kilometers to the South-East of Bagdadi. Geological exploration work resulted at Parzhali in the discovery of an anticlinal fold, formed of Miocene deposits. Oil indications were encountered in the Southern end, in a lesser proportion, in the Northern flanks of this structure. Detailed research work was organized in this area only since 1934, when shallow test drilling was also started. A few shallow test wells, drilled to average depths of 165 meters, yielded insignificant oil showings from Middle Miocene (Karagandian) Series, whereas Chokrakian-Spirialis stage of the same Series proved to be waterlogged in this area. Following .....

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these unsatisfactory results, further exploration work was temporarily discontinued in this area.

### 3. Zvar.

In the vicinity of Zvar, located at a distance of about 12 kilometers to the North-West of Parzhali, oil indications were discovered in Chokrakian-Spirialis (Middle Miocene) deposits. The Miocene formations of Zvar area form an extension of the Parzhali structure. Geological research work was undertaken at Zvar, but no definite results were as yet obtained here.

### 4. Demsey-Hevy.

Demsey-Hevy exploration area is situated ~~in~~ 15 kilometers to the East of Haraguli station of the Tbilisi-Batumi railway. A synclinal fold was discovered in this area, and oil seepages were encountered in the immediate vicinity of the village of Demsey-Hevy. Oil occurrence corresponds here to several horizons of Chokrakian-Spirialis stage (Middle Miocene Series). Geological investigations are being continued at Demsey-Hevy.

### 5. Vahani.

In this area, lying to the East of the preceding one, geological investigations were undertaken in order to discover other synclinal structures formed by Miocene deposits. No definite results were, so far, obtained here, the Miocene formations being less developed at Vahani, than it has been earlier expected.

Recent geological study carried out in Imeretia led to the hypothesis, that the areas situated to the North-East and East of the town of Kutaisi seem to be of a particular interest for further research work. To these areas belong: Demuisi, located in the zone of Okriba structure, where oskerit deposits are known, at a distance of some 25 kilometers of Kutaisi; and Djugeli, situated on the Rion river, in about 30 kilometers to the South-East of Kutaisi. A number of large folds were discovered at Djugeli, but no definite results were, so far, obtained in this area.

## C. THE EXPLORATION AREAS OF SOUTH-OSETIA & RACHI REGION.

This region of Georgia is situated in the middle part of the Southern flank of the Great Caucasus chain, and it is



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limited by Imeretia in the South, the district of Svanetia in the West, the Main Caucasus ridge in the North, and the province of Kahetia in the East.

From a geological standpoint this region can be subdivided into three separate zones, which extend almost in a latitudinal direction: a. The Northern zone (Tsona structure), passing over to Chiauri zone in the North; b. The Korta-Tedeleti zone; and c. The Java zone, including also the North-Eastern part of Imeretia. Large gently sloping folds are typical for Tsona zone, whereas the Korta-Tedeleti area is formed of a folding depression, consisting of Tertiary and more ancient deposits. But, in the Java zone the entire middle section, from Eocene to the Upper Jurassic strata, is absent.

Although oil indications were known in South-Osetia for a long time, the geological origin of oil could not as yet be determined in this area. A number of Soviet geologists suppose that Osetian oil is of Jurassic (Lias) origin, and that the discovery of oil shows in other formations can be explained as a result of subsequent migration, whereas others are inclined to admit a more recent origin of this oil.

a. Tsona zone.

1. Tsona area.

The tectonic structure of this area is characterized by the existence of a sloping anticlinal fold and of synclines. Tsona anticline is formed, in its core part, by Middle Jurassic deposits, whereas Upper Jurassic strata are predominant in its flanks. This anticlinal uplift is more than 10 kilometers long and between 1.5 and 2 kilometers wide in its creastal part. Middle Jurassic strata overlap here Lias formations, in which frequent oil showings are encountered. Oil seepages were also found in Middle Jurassic deposits. Geological research work and test drilling are being carried out at Tsona.

2. Lessa.

Oil indications were discovered at Lessa, situated at a distance of about 15 kilometers to the North-east of the Tsona village. An anticlinal fold was encountered in this area. Geological investigations organized here led to the establishment of the Lias origin of oil indications obtained in the shale-sand horizons in the domal part of the anticline. Geological research work is being continued in this area.

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3. Martkajin.

This exploration area is located at a distance of 10 kilometers to the North-West of Tzona. Geological exploration work resulted in the discovery of oil indications in Porphyritic stage of Middle Jurassic Series well represented at Martkajin. Geological investigations are being continued in this area.

4. Vatra.

Geological study led to the discovery at Vatra of an anticlinal uplift, in which oil shows, yielding up to 0.5 ton of oil per day from Middle Jurassic Series were encountered. Exploration work is being continued at Vatra.

5. Oni.

Small oil showings were known at Oni, situated at a distance of about 27 kilometers to the North-West of the Tzona village. Geological investigations were carried out in this area, but, so far, no definite results were obtained.

b. Korta-Tedeleti zone.A. Tedeleti.

At Tedeleti, located at a distance of 12 kilometers to the South-West of Tzona, oil and gas seepages were discovered in Lower Miocene and Upper Oligocene (Maikopian) formations. Geological exploration work is being carried out in this area.

2. Korta.

Oil seepages were also encountered in Korta area, situated at a distance of 10 kilometers to the South of the village of Oni. Geological study undertaken at Korta did not give any positive results.

c. Java Zone.1. Java.

This area is located to the East of Tedeleti. Oil seepages are encountered in Middle Jurassic deposits at Java. Geological investigations were carried out here.

2. Bali.

Asphaltic beds were discovered in this area, lying in the South-Eastern direction from the village of Java. Geological research work organized in this area, however, did not lead to any discoveries.

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**D. THE EXPLORATION AREAS OF KAHETIA.**

The province of Kahetia is adjacent in the West to Imere-tia; is limited in the North by the Main Caucasus chain; Azerbaijan in the East and the South-East, and the course of Eran river in the South.

A number of areas are under exploration in this region, but with the exception of Norio-Martkobi field, which has been brought into production in 1940, geological research work did not give, for the time being, any definite results in the most part of these exploration areas scattered over a vast territory.

Whereas in the South-Western part of this territory Cretaceous strata are predominant, in the central and South-Eastern parts of Kahetia Tertiary formations are well represented. These deposits consist mainly of of Miocene and Oligocene (Maikopian) Series, and farther eastwards - of more recent strata, including Upper Miocene (Sarmatian) and Lower Miocene (Pontic) Series.

As far as oil occurrence is concerned, the area situated to the North-East of the city of Tbilisi seems to be of a particular interest; in this area Lower Miocene and Upper Oligocene (Maikopian) deposits are oilbearing. Another interesting area <sup>is</sup> ~~is lying~~ in the basin of the Yora river, where Miocene strata are well developed. Finally, <sup>located</sup> parallel to this zone and further to the North-East, a belt of the Upper Miocene (Apsheonian and Akchagyyl) Series is <sup>located</sup> lying; these strata strike from North-East to South-West, and they extend into South Kahetia?

Among the exploration areas of this province should be mentioned the following:

1. Ildohany.

The tectonics of the Ildohany structure, striking at a distance of about 45 kilometers to the North of the city of Tbilisi, seems to be very complicated and has not been as yet studied. This structure is formed by a dislocation, in which Tertiary and Upper Cretaceous strata of the Chiauri zone are overthrusting the Lower Cretaceous formations of Kahetia. Oil indications are encountered at Ildohany in Miocene and Cretaceous deposits. In the past, insignificant local oil production by means of rudimentary pits and shafts took place at Ildohany, where surface oil seepages exist in the outcropping

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strata. In addition to geological research work and shallow drilling carried out in this area, deep test drilling was organized here, but up to the present time, no definite results were reported from Ildohany.

#### 2. Kavtis-Hevy.

Kavtis-Hevy exploration area is situated at a distance of about 20 kilometers to the East of the city of Tiflis, on the railway line. Geological exploration work resulted here in the discovery of an anticlinal structure, further investigations did not give any positive results.

#### 3. Gombory.

Two anticlines, complicated by overthrust and formed of Pliocene and Miocene deposits, were discovered in this area, situated 42 40 kilometers to the North-East from Tbilisi. Upper Miocene Series (Sarmatian stage), comprising good reservoir rocks in the adjoining areas, are supposed to be oilbearing at Gombory. Oil seepages were encountered in this area in outcropping strata. Oil indications exist in the North-Eastern and the overthrust flanks of the structure. Several horizons of Sarmatian stage (Upper Miocene Series) are under exploration at Gombory. Geological study and shallow test drilling are continued in this area.

#### 4. Gurjaani.

Gurjaani exploration area is located in the Eastern part of Kahetia, and it includes the territory lying between Telav in the West, and Signah in the East. This area is limited by the course of Yora river in the South, and - by the Alazan river in the East and North-East.

An anticlinal fold of a secondary origin was discovered at Gurjaani, and oil indications were encountered in this structure. Frequent oil seepages are met in the vicinity of Telav; as a general rule, these seepages correspond to Upper-Pliocene (Alazan) Series. Geological investigations were undertaken in this area.

#### Central Kahetia.

Central Kahetia is now divided in three tectonic zones: a. the Krasny Kolodny zone, b. the Kissaman zone, and c. The Palan-Tukian zone. Of these, the first two belong to the system of the main Caucasus chain, whereas the third zone belongs to the intermediate area between the main and the Lesser Caucasus. Each of these zones consists of several long folds with local uplifts, but up to the present only some of these local "highs" have been

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studied, so that their interrelation is not yet clearly established.

a. Krasnya Kolodzy Zone.

This is a long and narrow zone extending over a distance of about 100 kilometers, from Krasnya Kolodzy in the North West to Dash-Yus in the South-East. From a practical viewpoint this zone offers only a very limited interest.

1. Mkrali-Hevy.

Geological research work undertaken in the vicinity of this village, situated to the South-East of Krasnya Kolodzy, led to the discovery of a small local dome in the general system of folding; this dome appears to have been formed by Upper Tertiary deposits. Subsequently, some shallow drilling was done in this area, but it had to be abandoned for technical reasons. Geological studies are being continued.

2. Dash-Yus.

Dash-Yus is located at the other extremity of the Krasnya Kolodzy zone, not far from the town of Muha. Geological investigations resulted in the discovery of a fairly large anticlinal structure, the detailed study of which was not, so far, completed. It is to be noted that no surface oil seepages have ever been found in all of the Krasnya Kolodzy zone.

b. Kiasaman Zone.

This zone, located immediately to the South of the preceding one, is the most important of the three exploration zones of Central Kakhetia. As far as can be ascertained at present it consists of a number of long folds, striking from North-west to South-East, and of which has several culminations which are the object of research work. Petroleum indications are found mostly in Shiraki and Mirzaani areas, which were put on regular production, in Shirakian and Sarmatian stages of Upper Miocene Series.

The first tectonic line, or at least what seems to be one, pending further verification, extends from Mlashis-Hevy in the North-West to Kajuzinskaya in the South-East.

1. Mlashis-Hevy.

The presence of an anticlinal uplift has been discovered here by means of geological researches. Test drilling was organized at Mlashis-Hevy to Shirakian and Sarmatian strata.....

and oil indications were encountered for the first time in one of test wells, which were drilled in this area in 1946. In spite of this positive results, no commercial quantities of oil were, so far, discovered in Sarmatian Series at Mlashi-Hevy.

To this tectonic line also belong the exploited oil fields of Mirzaani and Shiraki, which have been briefly described above.

### 2. Kajuzinskaya.

This locality is situated in the extreme South-East of the Kiazaman zone, and is supposed still to belong to the first tectonic line. A structure with a very steeply dipping Southern flank has been discovered in this area, and natural gas seepages are known to exist in the vicinity. No drilling has yet been done here.

The second tectonic line of the Kiazaman Zone extends from Kila-Cupra in the North-West to Bek-Boulak in the South-East (See the map hereto attached).

### 3. Kila-Cupra.

The village of Kila-Cupra is located in the central part of a fold which can be traced for several kilometers both to the North-West and to the South-East of this village. The fold consists of Tertiary formations, from the Upper Pliocene Series (Akchaghyl stage) to Upper Miocene (Sarmatian) Series. Geological investigations were started here before the war, but no drilling has so far been done in this area.

### 4. Didi-Gor.

Didi-Gor is lying to the South-East of Kila-Cupra. A structure formed by Upper Pliocene and Upper Miocene deposits and which seems to be a continuation of the Kila-Cupra fold, has been discovered in this area. Geological exploration work was organized here, then discontinued to be resumed later on, and shallow test drilling was carried out with the purpose of testing the Sarmatian (Upper Miocene) deposits.

### 5. Taribani.

The Taribani anticlinal uplift is striking at a distance of 10 to 12 kilometers in the South-Western direction of the Mirzaani oil field, over about 15 kilometers. The axis of this fold is asymmetrical with the steeply dipping Southern flank and the gently sloping Northern one. The core of the anticline is formed by Upper Pliocene deposits and Upper Miocene (Shirakian) strata. Akchaghyl formations strike in the flanks of the structure.

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The Taribani anticline was discovered by means of geophysical methods. As it was thought that it offers particularly good prospects of encountering oil in industrial quantities, drilling was started after the first geological studies were made.

A number of test wells were drilled at Taribani to Shirakian and Sarmatian horizons (Upper Miocene Series) between 1935 and 1940 (wells Nos. 2, 3, 4, 5, 6, etc.). Some of these wells reached average depths of an order of 2,000 meters, but they did not attain the main sand horizons of Sarmatian stage. Oil shows were found by wells Nos 2 and 3 in Shirakian layers (Upper Miocene Series), but no commercial accumulation of oil were as yet discovered in this area. It is possible, however, that this failure was due to the use of inadequate technical equipment. Exploration work was resumed at Taribani since the end of the war, but, for the time being, no definite results were obtained.

#### 6. Bek-Bulak.

Bek-Bulak is located in the South-Eastern part of the second tectonic line of the Kiasaman zone. The presence of a structure in Upper Tertiary formations has been determined, and further geological investigations were undertaken.

The third tectonic line of the Kiasaman zone extends along the right bank of the Iora river, from Taura-Tapa in the North-West to Aylar-Sughl in the South East.

#### 7. Taura-Tapa.

At Taura-Tapa only geological research work has so far been organized, by means of which it was established that the third tectonic line extends as far as this locality and possibly even beyond.

#### 8. Baidy.

This exploration area is situated on the right bank of the Iora river. In this area Sarmatian (Upper Miocene) Series are outcropping. A presence of what appears to be a monoclinial structure formed by Shirakian and Sarmatian deposits has been established. Five oilbearing sand beds were encountered at Baidy, in lower Sarmatian strata, two layers in the middle Sarmatian, and three sand beds in the Upper Sarmatian Series. A number of shallow shafts were giving an insignificant oil production in this area. Two test wells, which were drilled at Baidy between 1938 and 1940, gave some oil from Upper Sarmatian deposits at the rate of 0.5 tons per day. Oil and gas

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indications were met at a depth of 333-385 in one the wells completed in this area before the war. No definite results were, however, so far, obtained at saidy.

#### 9. Alajighi.

Alajighi is situated immediately to the south-east of saidy. Geological investigations are being made in this vicinity, but no positive results were as yet reported from this area.

#### 10. Tulki-Tapa, Chatma.

The area lying between the villages of Tulki-Tapa and Chatma appears to be the culmination of the third tectonic line of the Kiasaran zone. Three wells were drilled in this area to test the possibilities of the Sarmatian deposits. Years ago some oil used to be obtained here in pits and shafts in the proximity of natural surface seepages.

#### 11. Aylar-Gughi.

Aylar-Gughi is situated on the border line between the Kiasaran zone and the more Southern Palan-Tukian zone, which belongs to the system of the Lesser Caucasus. The geological structure of the Aylar-Gughi area seems to be quite complicated, in that Miocene deposits seem to have been thrust from the North over the Upper Eocene deposits of Palan-Tukian. Geological research work was organized in this area.

#### c. Palan-Tukian Zone.

This zone extends from Lamed-Tapa in the North-East to Naftalan in the South-East. The stratigraphy of this zone is characterized by the absence of Shirakian and Sarmatian (Upper Miocene) deposits. Upper Eocene (Apsheeron and Akchaghyll) deposits are predominating and at least in some places they are followed immediately by the Paikopian (lower Miocene) deposits. Surface oil indications are not frequently observed in this area. The tectonic structure is complex and has not yet been studied sufficiently to enable us to present any generalised picture, so that we must limit ourselves to a summary description of the various isolated localities, where exploration work has been carried out up to the present.

#### 1. Lamed-Tapa.

In the vicinity of this village located in the extreme North-Eastern part of this zone, the presence of an antislinal



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structure has been determined, the core of which seems to consist of Lower Miocene deposits.

2. Kuruk-Kevlan.

This locality is situated to the South-East of the preceding one, and a structure very similar to the Mamed-Tapa anticline has been discovered here. In addition to geological re-research work, some test drilling was carried out on this structure, but without that any definite results could be obtained.

3. Palan-Tukian.

This seems to be the most important structure of this entire zone. It is formed by Akchaghyi and, contrary to the general for this zone, also by Jarmatian (Upper Miocene) deposits. So far, only geological investigations have been carried out, but it is expected, that test drilling will be started in the near future.

4. Gurzun-Dag.

Gurzun-Dag is situated to the South of Palan-Tukian, and the presence of a structure very similar to the latter has been established. It is even possible that Gurzun-Dag is a continuation of the Palan-Tukian structure.

5. Boz-Dag.

In the area between the western and Central Boz-Dag, there seem to be several anticlinal uplifts. Shallow wells drilled to the Akchaghyi sands (Upper Pliocene) gave small quantities of burning gas. Geological work is being continued.

6. Naftalan.

Naftalan is situated in the extreme South-Eastern corner of the Palan-Tukian zone. In this area Upper Pliocene deposits are lying directly over the Lower Miocene (Maikopian) strata. Small quantities of oil have been produced for many years in the Naftalan area by means of primitive pits? This oil is quite famous locally for its medicinal qualities. Drilling operations were started at Naftalan in 1937, and the presence of small accumulations of oil both in the Upper Pliocene (Akchaghyi) and the Lower Miocene (Maikopian) deposits has been confirmed. An insignificant crude production is being obtained in this area.

E. OTHER EXPLORATION AREAS OF GEORGIA.

Exploration for petroleum in the province of Abkhazia, situated to the North-West from the district of Mingrelia (See the Map hereto attached), remained so far, in its initial phase

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Geological investigations were limited to the basin of Kodor river, flowing into the Black Sea and taking its source at the Kodor pass of Main Caucasus ridge, where three domal uplifts have been discovered. Lower Miocene (Maikopian) formations are strongly developed in Abkhazia. The structures recently determined consist of Maikopian and Sarmatian (Upper Miocene) deposits; these domal uplifts are situated in the vicinity of the villages of Iadghi and Ganushki. In view of the fact that in areas adjacent to these structures Maikopian sandstones are generally bituminous, the discovered domes may be interesting for exploration. Inasmuch as Maikopian series is well represented in this region, it is expected to discover other structures more favourable for test of these formations. Geological research work is being continued in Abkhazia.

In addition, exploration work was also organized in Mingrelia, but, so far, no definite results were obtained in this province.

#### IV. CRUDE OIL RESERVES OF GEORGIA.

With a total cumulative production of about 980,000 tons since the beginning of exploitation of its fields (including the earlier production by means of rudimentary methods), the crude oil reserves of the USSR can be estimated as follows:

<u>Crude Oil Reserves.</u>	
<u>Category.</u>	<u>Metric Tons.</u>
Proven -	560,000
Semi-Proven -	3,000,000
Probable -	23,000,000
Possible -	25,000,000
<b>Total:-</b>	<b>36,560,000</b>

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The above estimates were based upon the calculation of various categories of geological petroleum reserves in Georgia, made as of January 1st, 1941, following the discovery of new oilbearing areas of Norio-Martkopi and Subsa-Tppareti.

[redacted] the total amount of crude reserves of Georgia should be estimated at a much more important figure, but, so far, such a too optimistic appreciation was not justified by facts; and in our opinion the above given figures are more adequate, than any exaggerated estimates of potential reserves of Georgia.

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**V. SPECIFICATIONS OF GEORGIAN CRUDE OILS.**

Below are given a few specifications of the most typical crude of The Grusneft:-

**1. Shiraki crude.**

Specific gravity at 20°C	-	0.885
Engler viscosity at 50°C	-	2.20
Flash point (Abel-Pensky)	-	0°C.
Paraffin content (Golde)	-	0.55 %
Coagulating point	below -	-20°C
Sulphur content	about -	0.2 %
Resins content	-	34.0 %
Coke content (Conradson)	-	7.1 %
Acid content in SO <sub>3</sub>	-	0.012 %

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**2. Mirsaani Crude (Horison VI).**

Specific gravity at 20°C	-	0.885
Engler viscosity at 50°C	-	1.79
Paraffin content (Golde)	-	0.4 %
Coagulating point	below -	-20°C
Sulphur content	about -	0.2 %
Coke content (Conradson)	-	4.21 %
Acid content in % SO <sub>3</sub>	-	0.01 %

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**3. Mirsaani Crude (Horison IX).**

Specific gravity at 20°C	-	0.871
Engler viscosity at 50°C	-	1.51
Paraffin content (Golde)	-	0.5 %
Coagulating point	below -	-20°C
Sulphur content	about -	0.2 %
Resins content	-	23.4 %
Coke content (Conradson)	-	4.28 %
Acid content in % SO <sub>3</sub>	-	0.04 %

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Generally, Georgian crudes are subdivided into two groups: a. paraffinous crudes, and b. paraffinless crudes with high resins content. Both these types of crude are rich with benzene fractions and poor in kerosene fractions. Gasolines with low octane number are being obtained from these crudes, as well as lubricating oils distillates with a low specific gravity.

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## VI. GENERAL SUMMARY AND CONCLUSIONS.

Summarising, it should be mentioned, that no new discoveries of any general importance were made in the exploration areas of The Grusneft during the last five years (1946 - 1950). Crude production developed with an extreme slowness in the exploited oil fields of Georgia, which comprize: - 1. Mirsaani, and 2. Shiraki, situated in Kahetia; 3. Herio-Martkobi, located at a distance of 24 kilometers of Tbilisi, the capital of Georgia; and 4. Subsa-Opareti, lying in the province of Guria, in about 50 kilometers of the port of Batumi. The total annual crude production of these four small fields is now of an order of 120,000 tons, whereas the further development of the above oil fields is much delayed, due to poor average per well yields (between 1 and 5 tons per day) and a number of local technical difficulties, such as, for instance, extremely complicated tectonic structure of the most part of geological regions of Georgia.

Thus, the role of the oil industry of Georgian republic still remains <sup>limited</sup> to the satisfaction of local demand for petroleum products, while earlier hopes regarding a rapid increase of The Grusneft crude production were not, so far, justified by the actual producing possibilities of its fields.

Although, Georgia is mainly an agricultural country (tea, orange, lemon, tobacco plantations, vineyards, <sup>maize</sup> and wheat), considerable efforts are being made by the Soviets in order to industrialise this territory. A new steel production centre is being created at Rustavi; coal mining is being developed at Tkvmcheli and Tkvibuli, whereas production of manganese ore continues to increase at Chiaturi. Mechanical plants and automobile works have been built in Tbilisi and Kutaisi, and a number of hydroelectric power plants have been erected on Rion, Hram, Kura and other rivers.

As regards the immediate prospects of petroleum industry, unless some new discoveries are made, these seem to be rather unfavourable. With the proven and semi-proven reserves available in exploited fields of The Grusneft, their production will gradually increase, but to a limited extent. In a general way, the oil fields of Georgia present now purely a local interest, and the experience of the last ten years proves, that one cannot expect a rapid development of crude production in this part of the U.S.S.R..

