

Geología

OMAR COLMENARES

GUIDEBOOK
TO THE GEOLOGY OF
MACHIQUES HIGHWAY
AND
RIO NEGRO
DISTRITO PERIJA, ESTADO ZULIA

FOR

FIELD TRIP APRIL 11 & 12 1959

OF THE

SOCIEDAD GEOLOGICA DE VENEZUELA OCCIDENTAL

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SOCIEDAD GEOLOGICA DE VENEZUELA OCCIDENTAL

FIELD TRIP TO RIO NEGRO

April 11 and 12, 1959

by John B. Miller
Richmond Exploration Company

INTRODUCTION

This guide book covers the plan and provides a topical outline of the field trip of the Sociedad Geológica de Venezuela Occidental to the District of Perijá scheduled for April 11 and 12, 1959. During this trip the most important formations of this area will be visited at accessible outcrops, and several of them at their type localities.

This book may serve in the future for individual or group geological excursions to the Perijá area. For such use, modified routings are described which will avoid complications in timing and in unnecessary use of private and closed roads.

For the scheduled SGVO trip, the party will assemble at the Richmond Km. 2 Maracaibo camp at 1:00 P.M. on April 11, 1959. During the afternoon, outcrops of the Miocene La Villa and Los Ranchos formations will be observed at their type localities. The party will then proceed to the Richmond San José camp by means of an unsurfaced branch road past Richmond's San José wells. An overnight stop will be made at the San José camp, where a barbecue dinner will be served. Each participant will have to furnish his own cot and bedding at this stop, because the camp is unoccupied.

The next morning (April 12) the party will reassemble at Km. 122.1/2 (Bodega La Fortuna) on the Maracaibo-Machiques highway. Those unable to spend the night at San José may leave Maracaibo at 6:30 A.M., and drive directly to this point to join the main party. Departing from the assembly point at 9:00 A.M., the party will travel through Machiques to the Río Negro, where sections of Eocene, Paleocene, and Cretaceous formations will be examined. Lunch will be served at a noon stop on the Río Negro.

On future trips it will not be necessary nor convenient to route yourself over the road past the San José wells. The ordinary use of this private road is barred by a locked gate. Permission to pass has been kindly granted by Sr. Teófilo Rincón, who owns the ranch at the Río Apón crossing. The route is utilized only as an interesting side excursion on the way to the overnight stop at the San José camp, and is not of sufficient importance or interest to justify its use under other circumstances.

Access to the Los Ranchos type locality and to stratigraphic sections along the Río Negro was granted through the kindness of the respective owners, Sr. Enrique Finol of Maracaibo, and Sr. Alcibíades Andrade, who lives in Machiques.

SUPPLEMENTARY COMMENTS - CRETACEOUS NOMENCLATURE

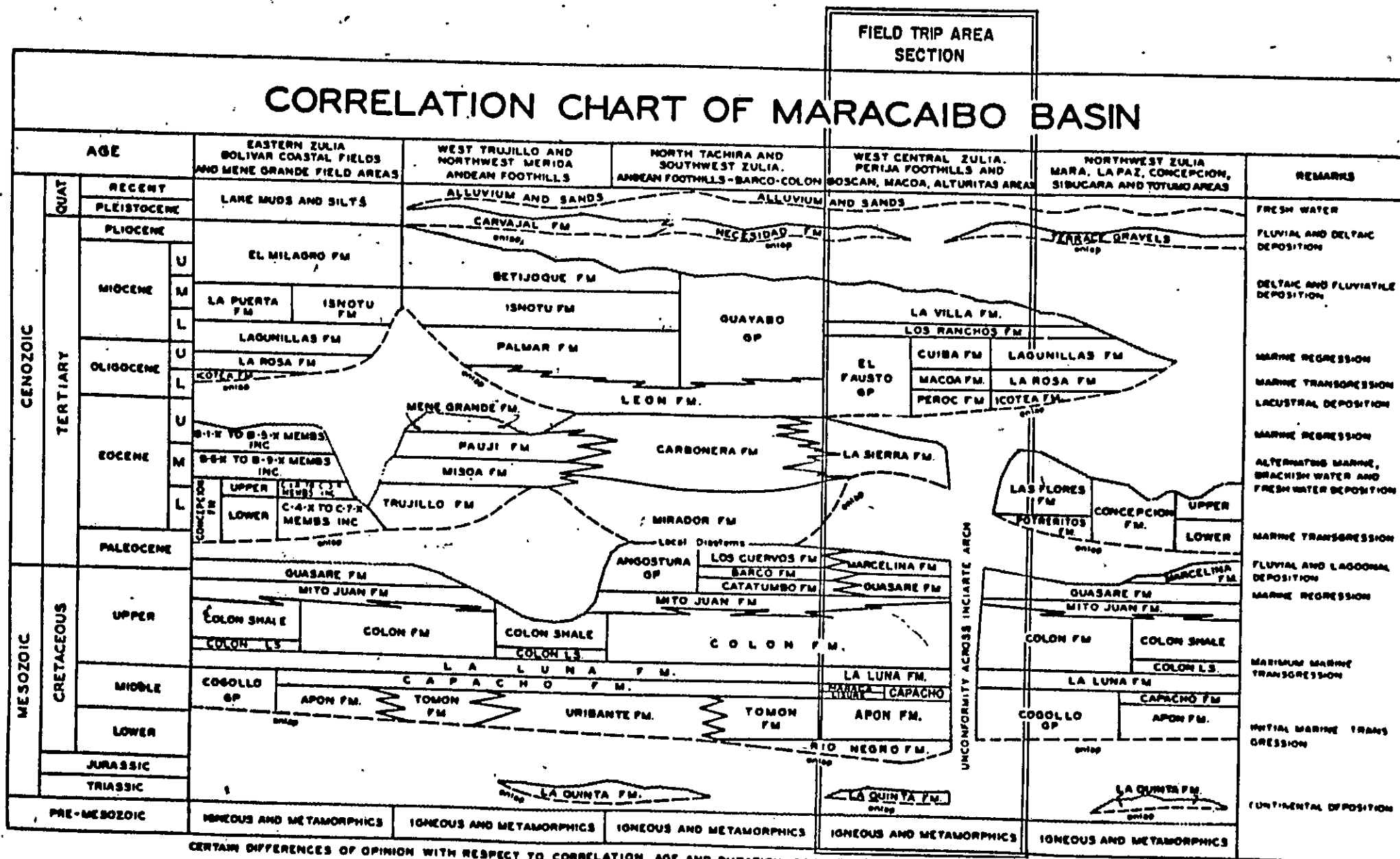
Further study of nomenclature used by Rod and Mayne demonstrates a probable partial misidentification, during the guidebook preparation, of the Maraca and Lisure units. Related to this is an evident discrepancy in placement to the upper boundary of the Apón formation.

With regard to descriptions in the guidebook, it appears likely that units called Maraca and Lisure by Rod and Mayne may both be contained in the "Upper Capacho limestone". Rod and Mayne have apparently brought the top of the Apón formation upward to include the shale-lime and shale members of the Capacho as defined in the guidebook. Thicknesses cited by Rod and Mayne for formation and member units on the Río Negro support this correlation of nomenclature, rather than the correlation indicated by the columnar section and guidebook text. A sandy, glauconitic facies in the lower part of the "Upper Capacho limestone" may actually be Rod's Lisure formation.

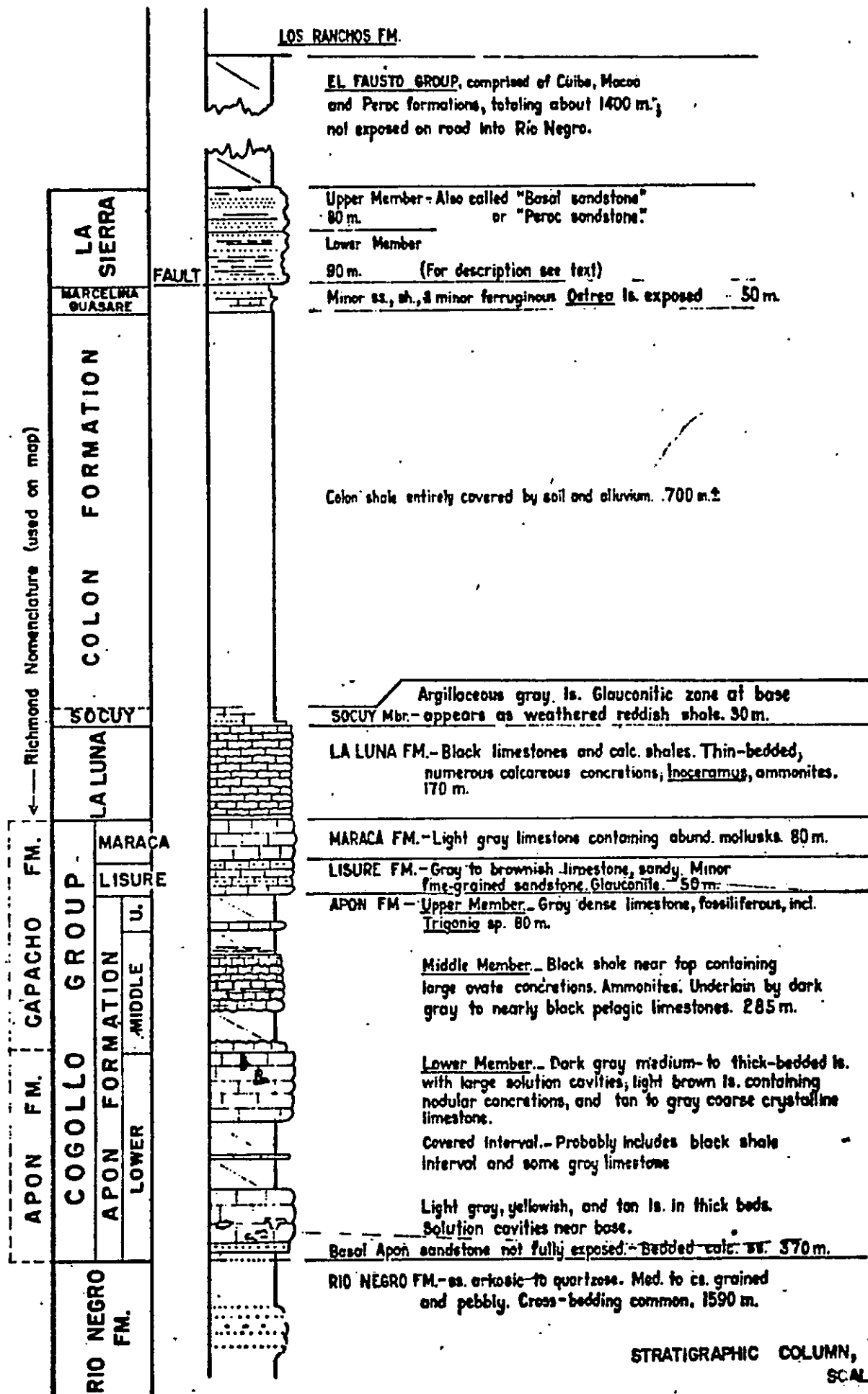
The problem of nomenclature should be examined critically during the field trip. An addendum or correction for the guidebook will be issued as appropriate after the trip.

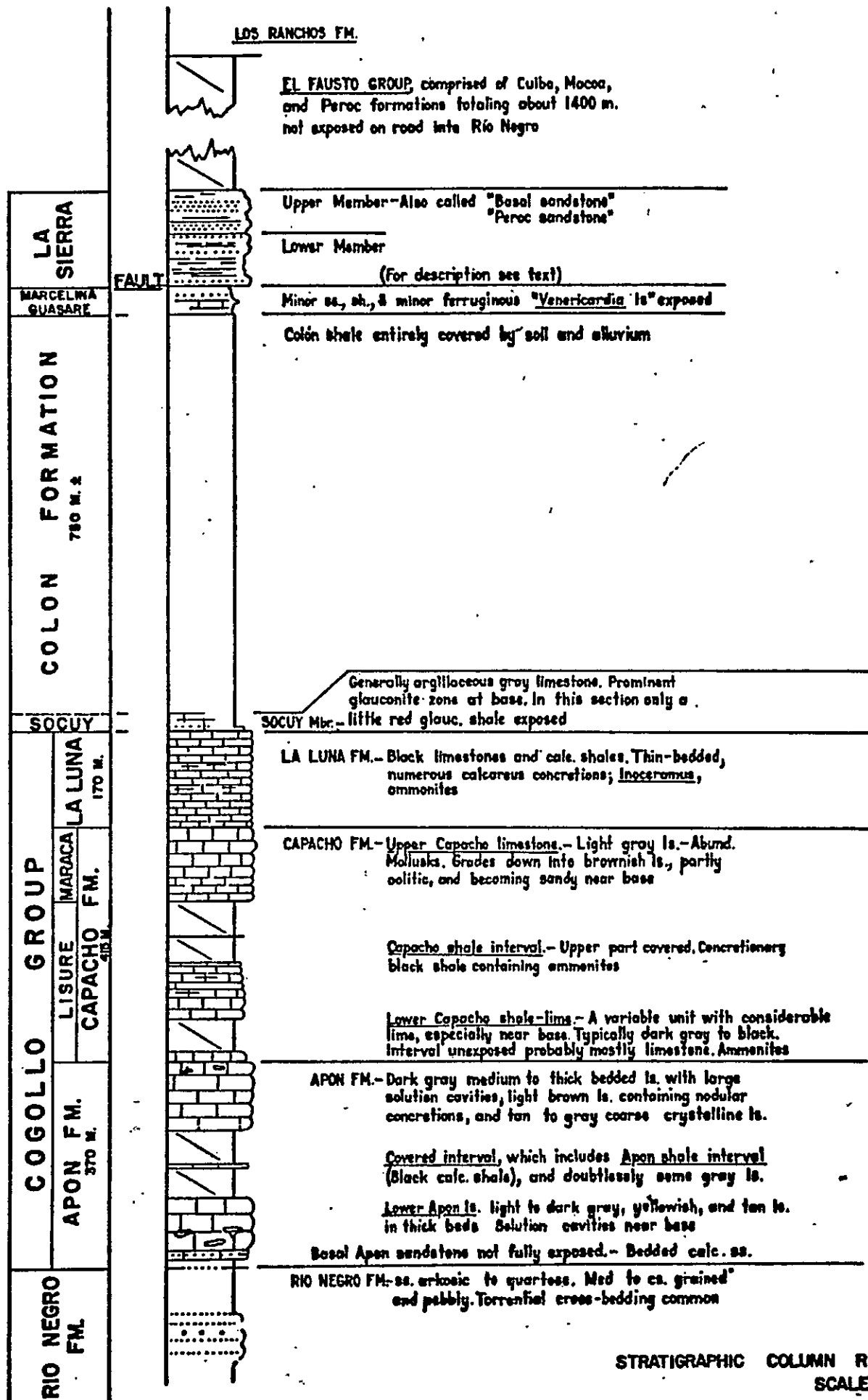
April
May 10, 1959

CORRELATION CHART OF MARACAIBO BASIN



CERTAIN DIFFERENCES OF OPINION WITH RESPECT TO CORRELATION, AGE AND DURATION OF HIATUSES EXIST AMONG THE VARIOUS OIL COMPANIES





ROUTE GUIDE*

(Speedometer distances approximate)

KM.

- 0.0 Richmond Camp, south edge of Maracaibo.
- 1.7 Fork, take R
- 18.5 Intermediate oil heating station on left. Part of Richmond's Boscán-Bajo Grande pipeline facilities, this plant is used occasionally to get the heavy Boscán crude heated and flowing after a shutdown.
- 32.0 ALCABALA FORESTAL, STOP. Logging trucks have to show their permits here to control indiscriminate logging. Road to La Concepción on R.
- 35.2 Km. 38 Near hill crest.
- 35.4 Hillslope westward. This may be a topographic expression of the Boscán fault zone. The Boscán fault limits the eastward side of the Boscán field, and strikes northerly.
- 37.5 STOP 1 - Richmond Heating Station. Pull off road to left and park. Oil from Boscán field, 10° API, is heated here before being pumped to Richmond terminal at Bajo Grande, 40 Km. away.
- 40.5 Richmond's well Boscán 8A-5 on R. The Boscán field wells are on both sides of road but their access is from lease roads behind so few wells are visible from the highway.
- 47.6 Well 9C1 on R.
- 54.3 Well 11F3.
- 63.0 Dairy Farming - The area from here south is a prosperous dairy farming country. Most of the land is held by large ranchers, of whom the majority live in Maracaibo or Machiques. During the past 20 years the heavy forest has been cleared and planted to tame pasture. The principal grass is pará, locally called "guinea" which is planted from seed or sprigs. Other pasture grasses are "aragua-brasileira" and "páez". The jungle is felled with axes, and burned during the dry season. Bulldozers are often used which can push down all but the largest trees and rack the brush into windrows which are easily burned. Many pastures are irrigated from rivers and also wells.

*Assistance in the compilation of the route guide, and the discussion on Dairy Farming and Indians, were provided by Parke A. Dickey of the Creole Petroleum Corporation.

The cattle are predominantly mixed breed, with dairy, such as Holstein and Brown Swiss, and Brahma (Cebú). Old Spanish criollo cattle mixed with Brahma are also common. The Brahmas are not good cows for either milk or beef, but they are much less bothered than other breeds by heat and insects. They have been widely crossed with European cattle in Texas, México, and South America during the past 50 years. Only about one quarter of the herd are usually milking at any given time, the rest being dry or young stock. All milking is done by hand, in open shed or corrals. The milk is cooled and hauled in tank trucks to Maracaibo. Some of it goes as far as Valencia. Some ranches are very large, shipping several thousands of liters of milk daily, and containing 10,000 or more head of cattle. Cattle are also sold for beef, but are not corn-fed before slaughter like the best U.S. beef.

Pigs are also raised, principally on plátanos and yuca.

The workmen are mainly Goajiro Indians or Colombians. These groups are both well adapted and trained for handling cattle.

The ranchers have been clearing forest rapidly southward. During the past few years work has advanced many kilometers across the Río Negro, Río Yasa, and recently the Río Tocuco. It has encroached on the territory of the wild Motilones Indians who have subjected workmen to several attacks in recent months. The Indian Mission of the Capuchin Fathers, and the Comisión de Indígenas has been trying to halt this encroachment. A proposal has been made that this area be called a forest preserve. Attempts are being made to stop the deforestation of the Perijá mountains by small settlers so as to preserve the water supply.

The sale of milk is very profitable as evidenced by the rapid expansion of the ranches and the use of heavy machinery. There is a ready market for the milk. Venezuela imports half its requirements of milk and milk products. There is a government subsidy on milk of the Bs. 0.10 to 0.16 per liter.

Reference: - Charles B. Hitchcock "The Sierra de Perijá, Venezuela", Geographical Review, January, 1954, pp. 1-28.

- 69.1 Bridge over Río Palmar. Large ceibote tree with orchids to L.
- 73.0 STOP 2 - Pull off on shoulder to R. behind the car ahead. Walk forward to outcrop. La Villa Formation, mottled clays. In earlier days when the highway was new and the road out fresh this La Villa outcrop was seen to be distinctly faulted. The faulting is evidently part of the north trending Palmar-Inciarte displacement.
- 78.6 ALCABALA, STOP
- 80.6 Carretera "La Culebra" to R. Palmar on R.
- 82.6 Entering La Villa del Rosario Keep R.

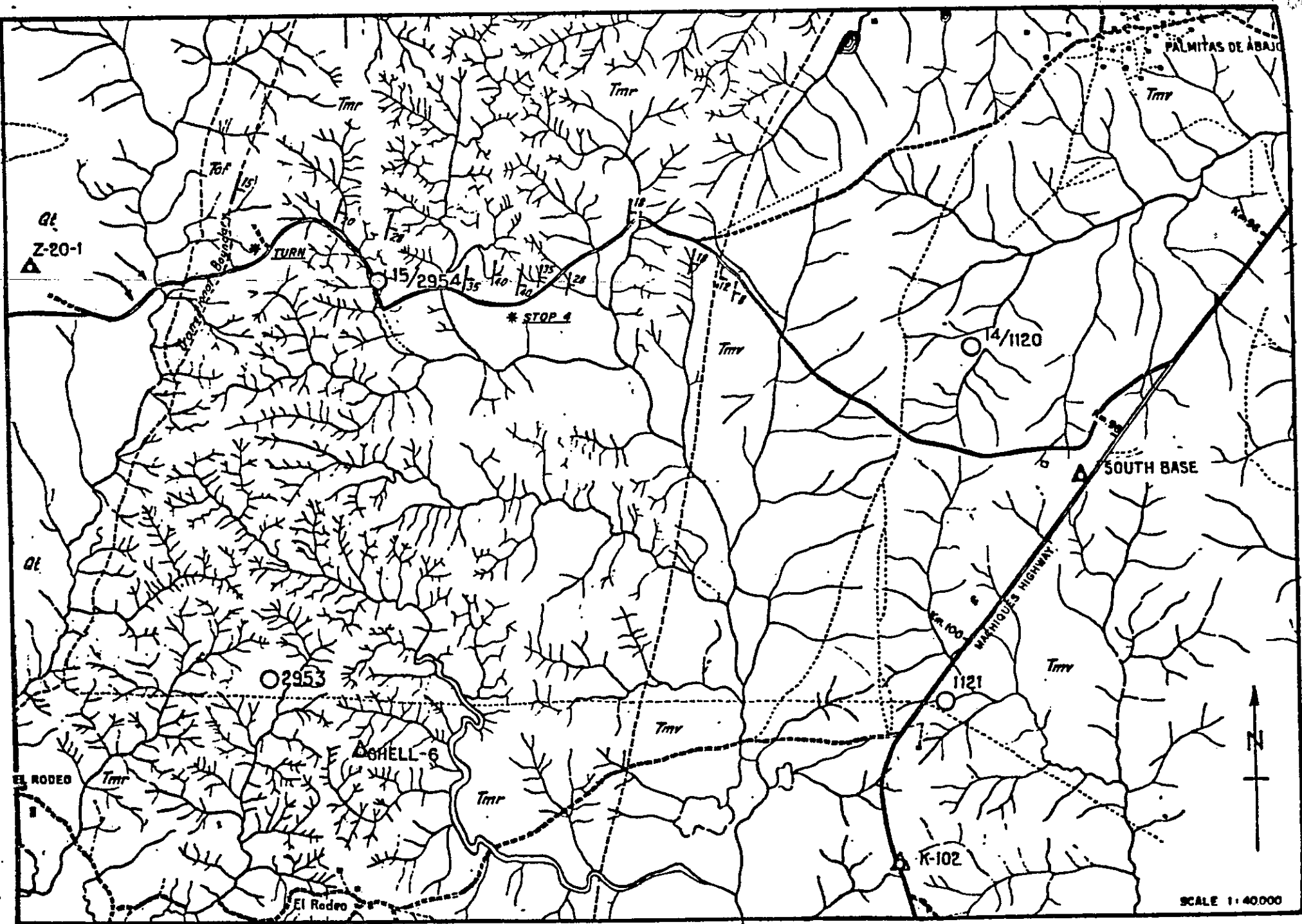
84.6

STOP 3 - Pull off road to R. past cantina, and up to crest of knoll above asphalt tank. La Villa Formation, upper Miocene or Pliocene. The type section extends from the vicinity of the town of La Villa westward for 8 or 9 kilometers to a boundary with the underlying Los Ranchos formation at the town of Arimpia.

The Stratigraphic Lexicon says of the La Villa - "The La Villa generally erodes to gentle slopes and low, rounded hills. Sharply formed hills locally stand above this surface, and apparently owe their presence to local resistance to erosion induced by secondary hematite or silica cements. Exposures are mostly confined to steep slopes of these hills, to gullies, and to road cuts. In the type section, sandstones evidently prevail over claystones and siltstones. Light gray to pale yellowish-gray colors prevail in all lithologies except where mottling is present... Mottlings in hues of pale red, purple, moderate red, and dusky or dark red are irregularly distributed. Sandstones are poorly sorted, in places conglomeratic, and may be argillaceous or arkosic. Stratification is poor; cross bedding is observed occasionally; jointing is prominently developed". (Color banding is not mentioned in the Lexicon, but is nearly as common as the mottling). The thickness of the La Villa is about 1000 meters.

From a high vantage point west of the town of La Villa del Rosario, one on a clear day can get a good view of the Perijá mountain front. This includes:

- 1) High peaks at bearing N 77° W, near headwaters of Quebrada Seca (Río Cogollo drainage). To the left of these, are hills of the Río Macoita drainage, and farther to the left, in extreme distance (southwest direction) may sometimes be seen higher peaks west of Machiques.
- 2) Headwaters of the Río Cogollo at bearing N 65° W.
- 3) A high rounded knob at bearing N 55° W. This is in the headwaters of the Quebrada La Gé. The high ridge extending from the N 77° W bearing through this knob lies in front (east) of the Río Lajas and contains diverse rocks evidently of Paleozoic and Mesozoic age.
- 4) A lower but pronounced frontal ridge composed of Cretaceous limestones. In a slope of this ridge directly in front of the peaks at N 77° W is the Quebrada La Luna.
- 5) Large dip slopes, inclined eastward at a low angle, seen in approximate direction N 30° W. These are Cretaceous limestones lying west of the Totumo arch and on the west (downdropped) side of the Tigre-Cuiba fault trend. In front of these dip slopes, and extending a little toward their right, are relatively bare slopes of Totumo volcanics. These are on the front (east) side of the Cuiba fault within the Totumo uplift. Farther to the right, in a northward direction, are other hills formed of basement rock, located north of the Río Palmar.



- 86.4 Road to Quebrada La Luna on R.
- 91.1 Hills visible a few km. to NE are Los Ranchos beds on E flank of Macoa structure.
- 94.8 Turn R on blacktop ranch road. A hundred meters off the highway by a house there is a gate which is usually kept locked. Permission to enter can be obtained from the people at the gate, or from Sr. Enrique Finol in Maracaibo.
- 99.2 Los Ranchos Fm. Type locality extends along the road from this point.
- 101.0 STOP 4 - Park on L. Los Ranchos formation (Miocene) sandstone and shale dipping E in E flank of Macoa nose. This location is about midway in the Los Ranchos type section. About 1500 meters (4900 feet) of sediments are included in the section.

Fairly high dips (locally as steep as 40°) are present here in this part of the Macoa structural limb. At greater depth the structure is distinctly faulted.

These are excerpts from descriptions of the formation in the Stratigraphic Lexicon: "Its outcrop area is typified by rugged topography and fine-grained drainage pattern, and differs in these features from the strike valley of the El Fausto unit and rolling "sabana" topography of the La Villa... About 50 or 60 percent of the formation is sandstone, and the remainder is mostly claystone. Minor amounts of pebble conglomerate or conglomeratic sandstone are present. The rusty-brown color of the sandstones, the buff to reddish-colored soils, and the ferruginous, brown or grayish-brown talus tend to impart a dark brown coloration to the general outcrop area. Sandstones in outcrops are variously stained by ferruginous pigments to hues of moderate brown, light-brown, and yellowish orange. Claystones are mostly very light gray, yellowish-gray, light greenish-gray, and may contain mottlings of grayish purple, or moderate and dark red. In well samples, light gray and olive colors appear, and rusty-brown coloration of sandstones is less prevalent".

From a hill summit south of the road one can see the Perijá mountains. The first big ridge is formed by the Cogollo limestones. The valley behind contains the Cuiba fault system, and is occupied by rocks of the La Quinta and Tinacoa formations. Behind is a higher ridge containing quartzites and conglomerates, which at least in part appear to belong to the Macoíta unit.

- 102.9 Basal sandy phase of Los Ranchos forming escarpment.
- 103.6 Road intersection. TURN AROUND.
A relatively low valley occupies the area between this point and the Perijá mountains. This valley contains the crestal area of the Macoa anticlinal nose, a structural feature that splits southward from the Perijá mountains. In part of its geologic history it is related to the Totumo arch. The valley represents the surface outcrop area of the El

Fausto group claystones, but mostly these claystones are concealed by the alluviated stream flat along the Río Cogollo, and extensive gravel and cobblestone terraces.

The Macoa nose has been drilled in several places. Some oil has been found both in the Cretaceous and Tertiary, but no commercial production has been established.

- 112.5 Main road, turn R.
- 113.3 Outcrop of La Villa formation.
- 118.6 Turn L on dirt road to San Ignacio off highway to go past Richmond's wells 36E2 and 36E3.

PEOPLE NOT WITH PARTY APRIL 11, CONTINUE ON MAIN ROAD TO KM. 122-1/2 OF HIGHWAY, WHICH IS KM. 169.3 OF THIS GUIDE.

Route from here to San José passes over private roads with locked gates for which special permission is necessary. There are no outcrops of interest.

Future trips should continue on main highway directly to Machiques.

Between Km. 110 (Río Cogollo bridge) and Km. 122-1/2 are several good outcrops of the Los Ranchos formation. One of the best is at Km. 111, about a kilometer south of the Río Cogollo.

- 118.7 Fork. Right fork preferable.
- 121.7 Village of San Ignacio.
- 128.4 Village of Villa Vieja.
- 131.5 Fork, keep R over cattleguard.
- 132.0 Right at intersection.
- 132.7 Richmond well 36E2 TD 16,237, Discovery well, San José Cretaceous Field.
- 134.3 Richmond well 36E3.
- 137.3 Bridge over Río Apón.
- 140.8 Fork, take either.
- 144.5 Keep straight.
- 146.7 Black-top road at outskirts of San José, turn L towards town.

- 147.3 Passing through village on narrow street. Turn R on road to Calle Larga.
 149.6 Turn R off highway on narrow black-top road.
 150.6 STOP 5 - Overnight Stop. Richmond's San José Camp.

Sunday April 12

- 154.0 San José, turn L.
 159.3 Las Piedras Village. Some cars may drop out and get gasoline here, as the party will reassemble at main road.
 165.8 Outcrop of Los Ranchos on hilltop and several more outcrops in next few km. Here both the Los Ranchos and La Villa tend to be largely mottled claystone, and are difficult to differentiate.
 169.3 Main highway at km. 122-1/2, Bodega La Fortuna. Pull off highway. Reassembly point to meet cars from Maracaibo. Gas station.
 173.0 Good view of Perijá mountains looking ahead, if not too smoky or cloudy.
 174.6 Entering Machiques. Keep L.

- 0.0 ~~276.0~~ Machiques Plaza Principal. Highway distance from Maracaibo 128 km.
 *{0.6} Stop street. Turn L one block. Stop street. Turn R on Calle Artes.
 {1.1} Turn L on Calle Villapol, 1 block before end of Calle Artes.
 {1.3} Stop street, Calle Registro. Keep straight across.
 {1.8} Fork, take L, past "Niágara" water tank.
 {3.0} Fork; take R on narrow black-top. The left road is the Colón-Zulia highway which is paved as far as the Río Yasa and transitable a good deal farther into the territory of the Motilone Indians. Settlers are clearing jungle and have recently been attacked.

There is a mission maintained by the Capuchin Fathers at the Río Tocuco about 60 km. farther south. It may be visited by appointment which can be made at the church in Machiques. There is a school attended by 140 Indian children.

Goajiro Indians - The Indians commonly seen along the highway are, with few exceptions Goajiros, from the Península of that name north of Maracaibo. The Goajiros are a healthy, active, upstanding, and comparatively prosperous tribe. They are nomads, wandering about the peninsula caring for large flocks of cattle, sheep, goats, and horses.

* distances from Machiques Plaza Principal.

They seldom plant crops. Because of their nomadic life they do not build houses but camp in slight brush shelters, of which many may be seen in the vicinity of La Villa and Machiques. In the Peninsula they are divided into a number of totemic clans or "sibs" each of which is named for an animal such as jaguar, rabbit, etc. They are matrilineal and a man's property is inherited not by his own son but by his oldest sister's oldest son. Their language belongs to the Arawak linguistic stock. Arawak speaking tribes once inhabited the Caribbean Islands, but were driven out by Carib-speaking Indians shortly before the arrival of Columbus. Arawak tribes are now mostly found in the Guayanas.

The men in the Peninsula normally wear only a breechclout and headband with a feather, but when dressed up wear a large kilt, sash, and mantle. The women wear ample flowing cotton dresses and sandals with large pompons. The women are excellent weavers, making hammocks and bright-colored belts from wool and wild cotton. Many of the men carry rifles and, until recently, bows and arrows. The bows are 5 to 6 feet long and are round in cross section. The arrows are of many different designs, tipped with black palm or serrated steel. The most dangerous are tipped with sting-ray barbs and poisoned. The poisoned tips are kept covered with a sheath of cane.

Motilonas Mansos

The Indian inhabitants of the mountains west of Machiques are called Motilonas Mansos by the Venezuelans, Chaké by ethnologists, or Yukpa by themselves. They are very different from the Goajiros. They belong to the Carib linguistic stock, and are farmers, raising corn, yuca, and sugar-cane, although they do some hunting and fishing. They are very small in stature, and some tribes average less than 150 cm. (5 feet) in height. They live in small villages or often in isolated houses, and are unfriendly and distrustful of each other. Formerly the men wore long robes and the women wore short skirts and a shawl or poncho over the shoulders. Now most wear ordinary clothes.

There are a number of different tribes which until a few years ago were in a state of intermittent warfare with each other. They used to raid each other and carry off the women. The most isolated and primitive are the Japledia who live at the headwaters of the Río Palmar. They have practically no contact with either Venezuelans or other Indians, and wear only small loincloths. The rest of the tribes have considerable contact with the Venezuelans and wear clothes, rubber boots, and have axes and machetes.

The Macoíta live in the drainage of the river of that name, and consist of about 300 people. The Río Negro, also called the Wosi or Inpare, consist of about 500 and live in 2 or 3 villages along the Río Negro, upstream from the outcrops we will visit. Smaller tribes are the Pariries and Guasamas on the Río Yasa, and the Chaparros and Irapa on the Río Tocuco. The Maracas live on the Colombia side of the mountains, and these are such tiny people that they have been called pygmies.

After the corn harvest the women prepare chicha by chewing corn and spitting it into wooden troughs, where it is mixed with water and allowed to ferment. The whole tribe then goes on a big drunk. During these "chicheos" the men play a curious game which consists of taking turns in hitting each other a blow on the head with a stick.

Their bows are quite different from those of the Goajiros, being much shorter and flat in cross section. The arrows are tipped with steel or with black palm, squared and barbed. They may be bought from the Capuchin Fathers in Machiques. They do not use poison.

Motilonos Bravos

The Motilonos Bravos or Mape call themselves Keshashamu. They are poorly known because of their virtually complete lack of contact with outsiders. Before the wars of independence the Capuchin Fathers operated several missions in the area of Santa Bárbara, south and east of the Río Catatumbo. Although they were hostile then, many became "civilizados" and their descendants form part of the population of that area. For the last hundred years there is no recorded instance of friendly contact.

They are not related to either the Goajiros or the Yukpa. A vocabulary made by the Capuchin Fathers in 1738 was lost for many years, and its recent discovery in Caracas established that their language is Chibcha, related to the former inhabitants of the high plateaus of Colombia and Ecuador. Two orphaned Motilone children were brought to the Tocuco Mission a few years ago. One died of polio and the other is still there. Another orphan boy lived in the Barco oilfields about 25 years ago. Not much has been learned of their tribe from any of these individuals.

Few people have ever seen a wild Motilón at close range, although they have killed hundreds of people, ~~including a few Americans~~. When a trail has been cut in the forest they issue a warning by sticking an arrow in the trail. Anyone passing later is apt to be ambushed. They do not hesitate to attack a large armed party. In the heavy forest such a party has to travel in single file, and it is possible for the Indians to kill several men silently with a volley of arrows and retreat before any is seen. In Indian country, it is best to use dogs to warn against the approach of Indians. It is a good idea, also, to avoid using the same trail or pica repeatedly, to make it difficult for the Indians to arrange an ambush.

They frequently used to raid the Barco and Colón oilfields. Attempts have been made to make friends by leaving presents but they have remained uniformly hostile.

The Indians are eager to obtain machetes, axes, and salt, and are interested in implements and other items. Recently they raided a farm house and went off with a battery radio. They seldom take food.

In contrast to the isolated dwellings of the Yukpa and the shelters of the Goajira, the Motilone houses are large tall buildings each containing probably a dozen or so families. These are located 5 to 10 km. apart. Each is surrounded by a cleared area where corn and yuca is grown. They live in the mountains in the rainy season, following down the rivers Ariguaia, Lora, and Santa Ana, in the dry season. Apparently they are good farmers and hunters both. Their well-organized raids suggest that they have a stronger social organization than the Yukpa.

Reference: - Smithsonian Institution, Bureau of American Ethnology, Bulletin 143, "Handbook of South American Indians", Vol. 4, Washington, 1948, pp. 349-383.

- (4.0)* Narrow bridge, caution. Drive carefully from here on as there are several more very narrow bridges.
- (9.7) Fork, take R.
- (11.0) STOP 6 - Eocene and Paleocene. Pull off road to R and walk to outcrops. This is the type section of the La Sierra formation.

Sandstone beds exposed in hills in the pasture to the northeast comprise the "upper member" of the La Sierra as described in the Stratigraphic Lexicon. Forward, in the road cuts, are sandstones of the La Sierra "lower member". Some geologists prefer to restrict the name "La Sierra" to what is termed the "lower member", because they believe there is an important unconformity at this boundary. Regardless of the unconformity, there is certainly a change in sand type, and sedimentary environment.

Descriptions from the "Stratigraphic Lexicon" read as follows:

"Upper Member" - Light gray (nearly white) to gray sandstone; interbedded subordinate amount of gray, olive, or olive-brown shale or claystone. Sandstone beds relatively thick, ranging from less than a meter to several meters; cross-lamination subordinate or lacking. Sandstone friable, poorly sorted, containing variable amounts of kaolin in interstices and fine seams. Claystone tends to weather light gray or yellow; sandstones may be stained with red or purple. Mineral suite of ilmenite, leucosine, zircon, titanite, rutile, and tourmaline".

"Lower Member" - Gray, olive, and olive-brown, fine and medium-grained sandstones, and light-gray, medium-gray, and olive-colored shales and siltstones. Stratification generally good, cross lamination common. Sandstone beds from a few centimeters to over a meter; sandstones may be friable, or quite hard; weather with rusty red, yellow, or brown staining. Shales weather yellowish-orange, and light gray. Siltstones may be gray or greenish; may have mottlings of purple. Carbonaceous streaks and laminae common; micaceous sandstones common. In some sections, tendency to a well defined shale interval at top of the member, and for predominant amounts of sandstone in the lower part. Mineral suite like that in upper member

~~(Distances from Machiques Plaza Principal.~~

except for abundant occurrence of 'pebbled' garnet."

The La Sierra section is near the western shoreline of the Eocene sea, where the Eocene section is thin. The overlying El Fausto sequence, which includes Oligocene elements of the section, is in turn very thick, totaling about 1400 meters. This is therefore a relatively axial phase with regard to the Oligocene "lagoonal" sedimentation which is completely missing in the eastern part of the Bolívar Coastal Fields. In environment, the "upper member" appears to be more closely related to the overlying Peroc formation than to the underlying "lower member" of the La Sierra. An unconformity is considered possible between the units. For these reasons, some geologists are now using the term "Basal Peroc sandstone" as a unit name of the "upper member", thus tending to shift the unit from the La Sierra formation to the Peroc. The terms "Basal Sandstone", and "Basal Oligocene Sandstone" are undesirable because they cannot serve as proper stratigraphic names.

The "Lower Member" probably is equivalent to part of the "B" sand sequence of Lake Maracaibo. The "upper member" here may be either Eocene or Oligocene. It may rise across time lines going eastward, where the corresponding "Basal Icoitea" unit is generally placed as Oligocene.

Going westward on the road, the base of the La Sierra is found at the seepage of asphaltic oil near the western end of the road cut. The boundary with Paleocene rocks, which is concealed, is probably slightly faulted by a minor displacement belonging to the Guiba-trend faulting.

About 15 or 20 meters west of the asphalt seepage, pass under the fence on north side of the road and go northward on old trail. Paleocene beds of the Guasare sequence are exposed locally on the trail, and pieces of Venericardia limestone float from the Guasare are strewn on the hillslope. The Marcelina sequence may be largely or entirely faulted out. An angular unconformity at the base of the La Sierra may also account for incomplete appearance of the Paleocene sections.

At hillcrest (small saddle along trail) about 100 m. from road one can view the mountain front. In the valley ahead (pasture land) is the Colón shale. This shale forms a prominent valley behind the Eocene hogback, a depression that is continuous southward to the Río de Oro and into Colombia. There are relatively few outcrops of this shale, and none will be seen in this trip. The first foothill seen behind the valley consists of the La Luna limestone in the first bench, and Capacho limestone which forms the bare ridge. Behind is a valley of Capacho shale, and the high wooded ridge beyond is Apón limestone.

Behind the Apón ridge one can see a considerable part of the hillslope on the south side of the Río Negro gorge. An Indian village named "Caracas" stands on a bench on the high grassy slopes of this valley wall. Sandstones of the Río Negro formation extend well down the slope into the gorge, and arch across the Río Negro

anticline. The Perijá fault passes through the topographically low area along the west side of the Río Negro anticline. High peaks beyond lie on the Colombian border at the headwaters of the Río Negro.

(13.2)*

STOP 7 - Cretaceous Section . Finca Medellín. Pull across cattle-guard and park out of the way. Walk back east along the road 800 meters, then northward through pasture 200 meters to irrigation ditch on slope of hill. On the eastern slope of the hill, at irrigation ditch, are found La Luna limestone and a reddish shale, containing weathered glauconite. The shale is apparently a facies of the Socuy Member, Colón formation. In this locality minor faulting occurs between these shales and the La Luna limestone. Fossiliferous La Luna concretions can be found in the pasture upslope from the irrigation ditch.

Follow the irrigation ditch westward upstream to observe the La Luna section, which continues for roughly 300 meters. Base of the La Luna is found several meters beyond the point where the steep hillslope breaks back away from the irrigation ditch. This is the east side of a small depression or drainage line. West of the depression are bold outcroppings of the light gray, fossiliferous upper Capacho limestones.

The La Luna type section is located on the Quebrada La Luna in the Río Cogollo drainage, 35 km. to the north.

Leave the irrigation ditch at the La Luna contact and continue westward through pastures to observe the Capacho limestones. These limestones are the Maraca formation as defined by Rod and Maync (Bull. AAPG Vol. 38, No. 2, pp. 210-212, 1954). The Maraca Type section lies in the Río Yasa drainage 10 kilometers southwest of this point. Continue to end of outcrop belt approximately north of the Medellín ranch houses. Return to ranch, passing through or around corrales.

~~(Lunch will be served here on April 12)~~

From bridge at Medellín ranch, walk southwest along road to outcrops of Capacho shale and limestone in hillslope. This is the middle part of the Capacho section, and is an ammonite locality, although it has been pretty well picked over. From outcrops along this road, go westward through pastures, using the fence line along the base of slope as a guide to first outcrops. These are Capacho limestones near the base of the Capacho section, and lithologically are somewhat like the La Luna. There may be slight faulting in this part of the section, mostly above the limestone (evidence largely photogeologic).

The middle and lower part of the Capacho formation, including the Capacho shale interval and "lower Capacho shale-lime" is the Lisure formation of Rod and Maync. The Lisure type section is on the Caño Cusare in the Río Yasa drainage 20 kilometers to the

southwest. Some local geologists consider the terms Maraca and Lisure as preferable to the word Capacho. The Capacho type locality is in the vicinity of the town of Capacho (now called Independencia) in western Táchira. It appears possible that the lower part of the Capacho formation of the Andes is younger than what is called Capacho in the Perijás. West of the Capacho limestones is a narrow covered interval, and then is found the prominent upper limestone member of the Apón. Exposures of Apón lower in the section are found along the base of the bluff going westward until one emerges at a bend of the Río Negro. The basal part of the Apón limestone, and the Apón sandstone, crop out at a pool in the river. The type section of the Apón formation is on the Río Apón, 3 km. to the north.

Walk upstream for about 100 meters from the base of the Apón, and find trail that climbs from bank of the Río Negro up a spur of the hillslope. A good exposure of Río Negro sandstone is found on the spur, about 200 meters up this trail. Continue past this outcrop and promontory to fence, then diverge down the slope past headwaters of a small stream to other Río Negro outcrops. A trail following the route can be spotted from the hillslope before you advance. Cross the Río Negro, and follow cattle trail north to main road.

The Río Negro formation has an estimated thickness of 1000 m. in this area. Its type section extends from this locality upstream for about 10 kilometers.

From this location again it is possible to view the upper valley of the Río Negro, defining the position of the Indian village on the high bench south of the river, the position of the Río Negro anticlinal axis, which is near the village, and the lower ground beyond the anticline which marks the position of the Perijá fault.

Turn right on road, and return to cars at the Medellín ranch (about 2 km.). Return to Maracaibo.

Walk upstream for about 100 meters from the base of the Apón, and find trail that climbs from bank of the Río Negro up a spur of the hillslope. A good exposure of Río Negro sandstone is found on the spur, about 200 meters up this trail. Continue past this outcrop and promontory to fence, then diverge down the slope past headwaters of a small stream to other Río Negro outcrops. A trail following the route can be spotted from the hillslope before you advance. Cross the Río Negro, and follow cattle trail north to main road.

The Río Negro formation has a measured thickness of 1950 m. in this area. Its type section extends from this locality upstream for about 10 kilometers.

Turn right on road, and return to cars at the Medellín Ranch (about 2 km.). Return to Maracaibo.