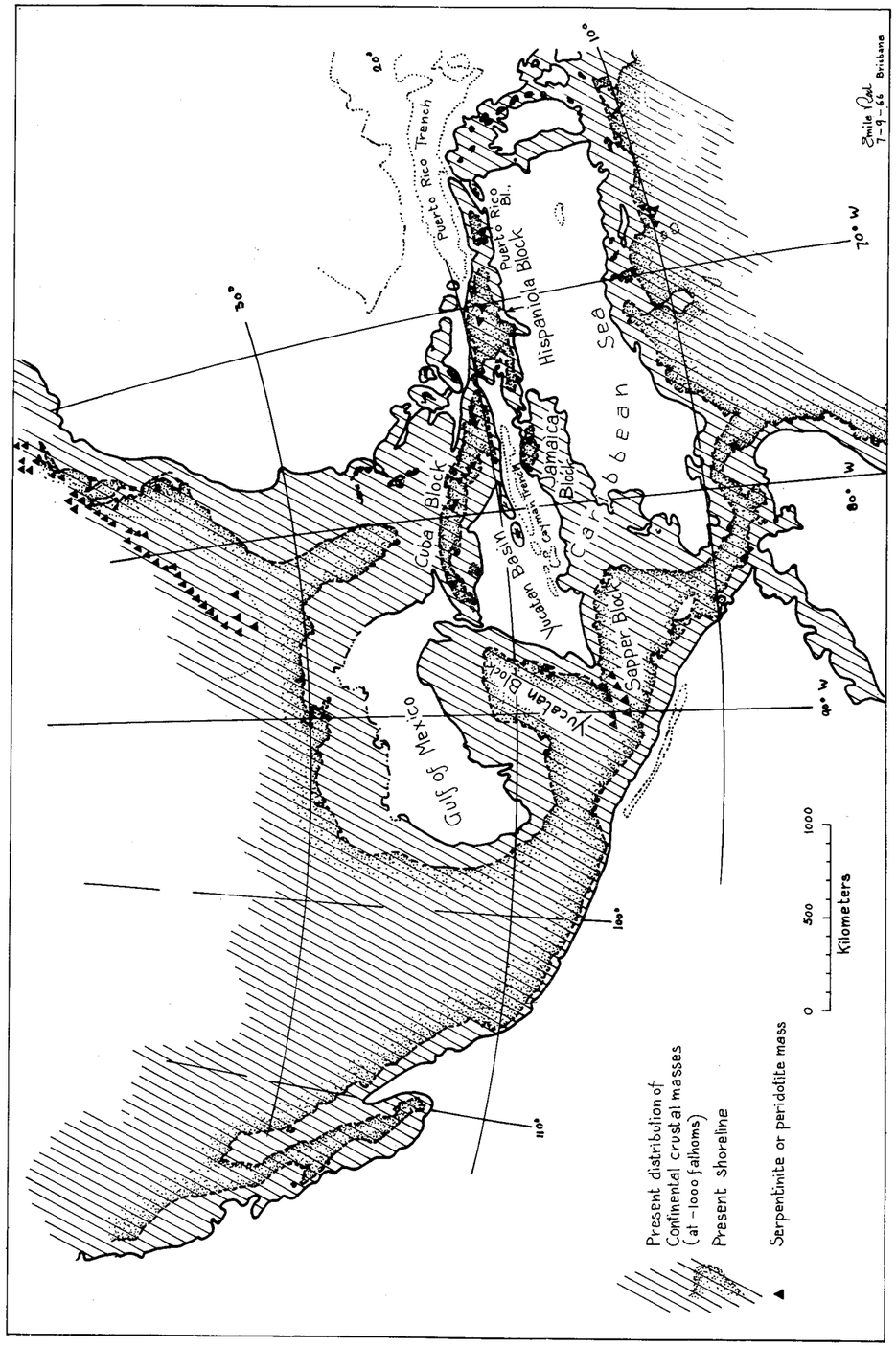

Fig.1. Antillean-Caribbean area. Present distribution of continental crustal masses.

ARTICULO

PALEOTECTONIC RECONSTRUCTION OF THE ANTILLEAN-CARIBBEAN AREA FOR THE CLOSE OF THE CARBONIFEROUS

(RECONSTRUCCION PALEO-TECTONICA DE LA REGION CARIBE-ANTILLANA AL FINAL DEL CARBONIFERO)

por Emile Rod*

While reading the review by Weyl (1965) on the paleogeographic evolution of the Central America - West Indies area, the writer noticed that, when showing the paleogeography of the Antillean-Caribbean area for the late Paleozoic or the early Mesozoic, most of the authors use as their base a map having the present day distribution and relative position of land and sea.

According to these authors the relative position of the islands in the Antillean-Caribbean area to one another and to the continents of North and South America remained always the same. Moreover, this stability on the maps is maintained in spite of the frequent remarks in the text on periods of great disturbances, of folding, faulting and considerable horizontal movements.

Hess and Maxwell (1953) reported large-scale horizontal displacements along strike-slip faults bordering the northern flank of the oceanic Caribbean Block, Bucher (1950), Rod (1956), Alberding (1957) and Rod (1959) discussed the crustal movements along the strike-slip faults of northern Venezuela.

Suggestions on how to restore the displaced crustal fragments to the position they occupied before the faults developed, were made especially by Hess and Maxwell (1953), Carey (1956, 1958) and Alberding (1957).

Carey found the key to a most satisfactory restoration of the area. It is his great merit to have shown that the solution consists in rotating and moving back the Central American Block into the Gulf of Mexico (Carey, 1958, fig. 24b).

Based on Carey's (1958) first model for a reconstruction of the Antillean-Caribbean area (the second model is unsatisfactory (Carey, 1963) as it disregards many of the well established structural features of Northern Venezuela and the southern Caribbean) the writer has worked out a modified version which can consistently explain all observations in the area.

The writer presents a tentative reconstruction of the area in Fig. 2. It is a sketch map but it contains all the essential crustal restorations. The map is based on many of the publications mentioned in Weyl's bibliography and especially on the works by the following authors: Hess and Maxwell (1953), Carey (1958), King (1959(, Eardley (1962) and Mencher (1963).

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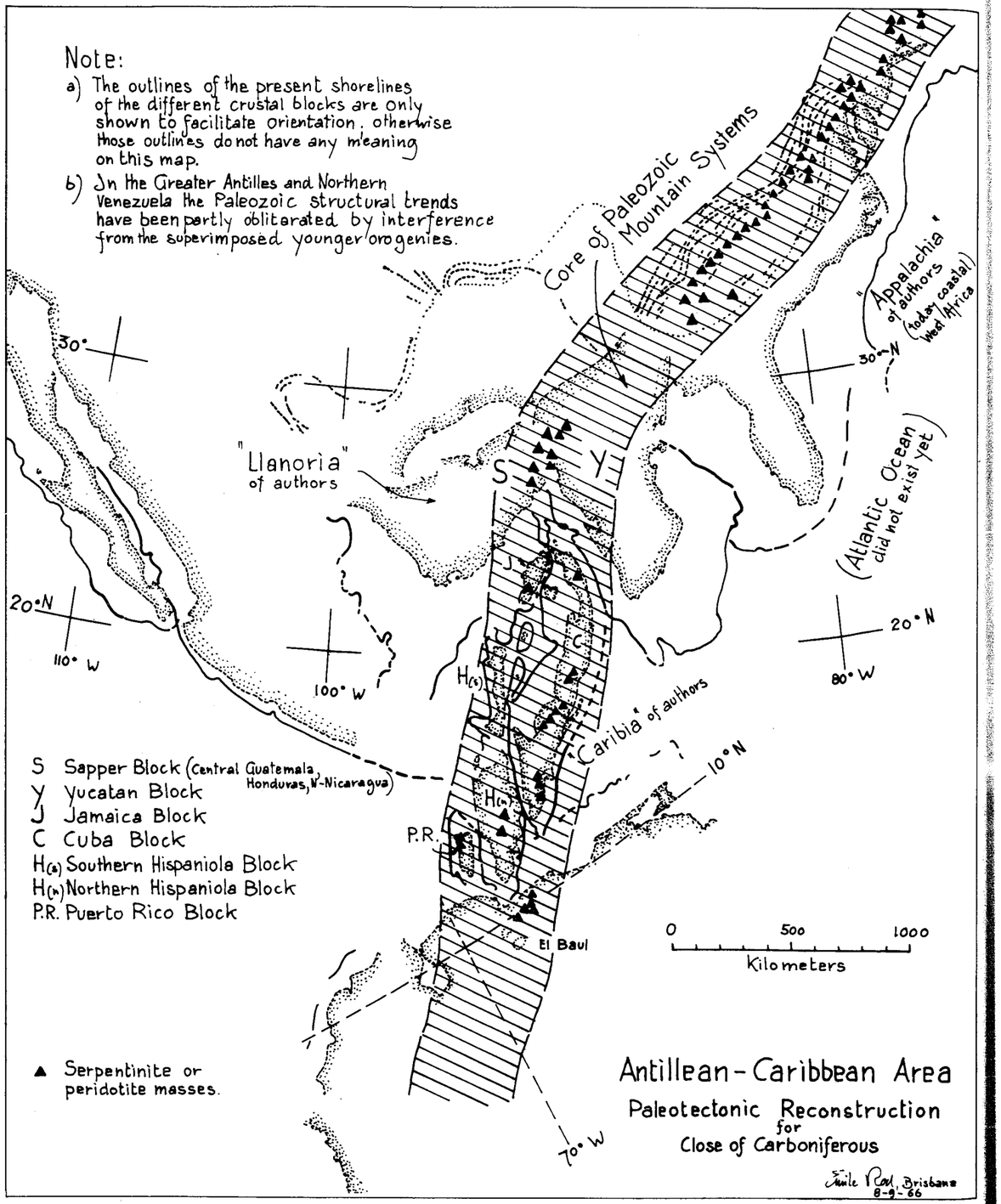

Fig.2 : Antillean-Caribbean area. Paleotectonic reconstruction for the close of the Carboniferous. This sketch map gives the outlines only of the proposed reconstruction. In general no allowances were made for all the sediments and volcanics accumulated or rocks intruded after the close of the Paleozoic. Moreover, all the displacements of small crustal blocks of northern Venezuela and Colombia have not been reversed. The small crustal fragments of the Virgin Islands will eventually also find their place.

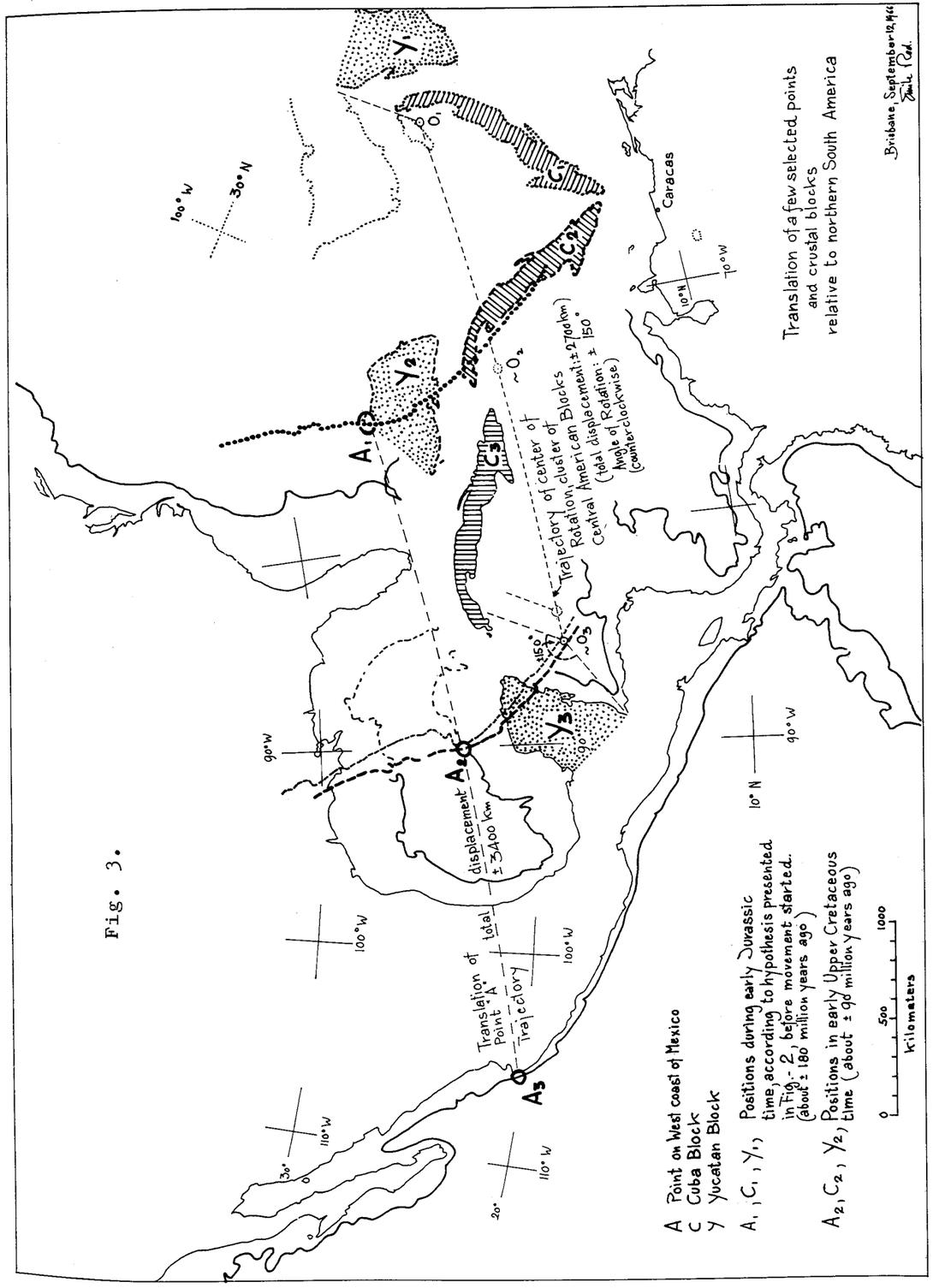

Fig. 3.

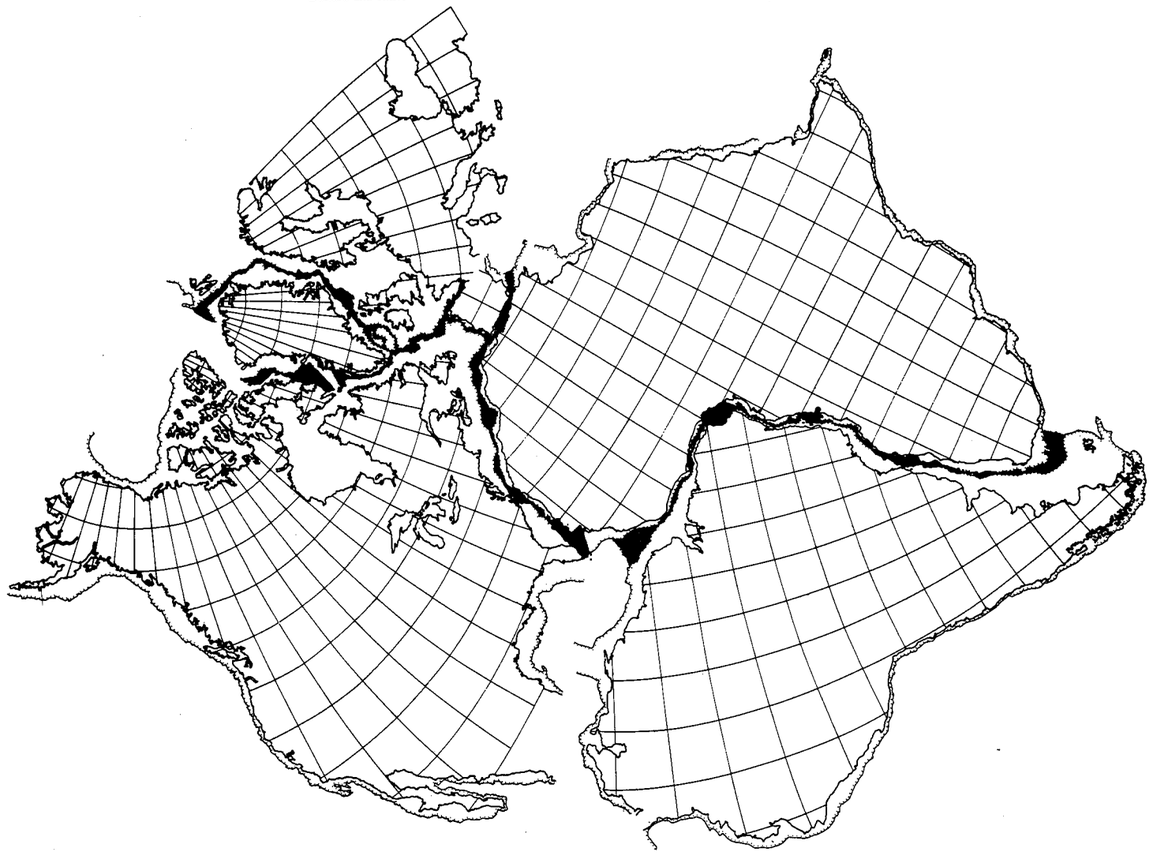

Fig.4. Fit of all the continents around the Atlantic at the 500 fm. contour. (After Bullard and others [1965], Phil. Trans.A, volume 258, Figure 8.)

The writer intends to work out all the details too, but as this project will take some time to complete he submits this provisional map with an invitation to the paleogeographers to experiment with it, to criticize it, modify it and to publish their findings in the Boletín Informativo.

In Fig. 3, an intermediate stage in the displacements of the crustal blocks is shown. According to the hypothesis adopted here, the solid continental mass started to break up after the last phase of the Appalachian orogeny. At first some fault zones formed - perhaps as early as in the Permian - which during the Triassic widened to large-scale rift valleys. These rift valleys got gradually wider and deeper until arms of the sea penetrated into them. In the deepest parts of the rifts mantle material came up to form an oceanic crust. This was the beginning of the Gulf of Mexico and of the Caribbean Sea.

The Antillean-Caribbean area started to break up in Jurassic time when the drift of the torn-off crustal fragments began. It was a creep of an average velocity of 2 centimeters a year. The creep of the cluster of Central American crustal fragments was combined with a counterclockwise rotation of about 50 minutes of degree in one million years.

The drifting of the North and South American continents and the creep and resulting drag of the Central American and Antillean Blocks caught between them (Carey's Antillean buffer zone) is a simple, smooth and most harmonious movement.

The writer assumes that the classic reconstructions or fit of the continents around the Atlantic (Baker, Wegener, Du Toit, Carey) are well known by the readers. As a refresher the latest map of the fit by Bullard, Everett and Smith (Bullard et al., 1965) is reproduced here, with the kind permission of the authors, as Fig. 4.

Assumptions and Conclusions
(Note: all movements are described relative to Venezuela)

1. The bottoms of the Gulf of Mexico, the Caribbean Sea with its three basins, consist of new oceanic crust. As they opened up, starting from a deep rift valley in Triassic or Jurassic time, their crust is very likely intermediate.

2. The core of the Paleozoic mountain systems which should also indicate more or less the axis of the Paleozoic Tethys, extended from the Appalachian region straight to the southwest into the ancestral Central American blocks and swung then smoothly in a southerly direction into the Greater Antillean blocks and the Caracas region of Venezuela.

3. This core of the Paleozoic mountain systems is characterized by a serpentinite belt. The writer is a staunch supporter of Hess's ideas on the great value of serpentinite belts for finding the axes of ancient mountain systems (Hess, 1955).

4. It is postulated here that all the serpentinite and serpentinized peridotite masses of the Greater Antilles and Venezuela are Paleozoic but seem to be "intruded" into Cretaceous sediments because of solid emplacement along strike-faults or in localities of great tectonic disturbances. (Compare Hess, 1960, "Caribbean Research Project : Progress Report").

5. In the Caracas-Tinaco region of Venezuela the ancient south-westerly direction of the Paleozoic structural axes is effaced by the late Cretaceous and Tertiary orogenies. Nevertheless, the axial belt is well marked by the serpentinized peridotite masses coming up in the fault zones, by the Tinaco Basement Complex, the El Baul Swell and the Colorado Massif.

6. There is no need to look for any foundered borderlands in order to explain the source of the clastics in the sediments, for instance of the Jurassic Cayetano Formation of Cuba or the shales in the Cretaceous of Jamaica. The large borderland "Caribia", postulated by several paleogeographers, never existed.

7. At the close of the Cretaceous a subcrustal, east flowing counter-current developed near the northern border of Venezuela. This current which, during its early stages, very likely came into being at the bottom of a rift valley, gained rapidly in intensity, accelerated the rotation of the Central American and Greater Antillean blocks, strongly dragged the smaller crustal fragments at the tail end of the rotating cluster of blocks and formed the arc of the Lesser Antilles at its front. Along the north coast of Colombia and Venezuela the powerful drag of the Caribbean current caused large strains in the small crustal blocks which were all sheared and displaced relatively to the east.

8. Although the origin of the geosutures (large-scale strike-slip fault zones in the sense of Hans Cloos, 1948) bounding the Caribbean oceanic block to the north and south goes back to the close of the Cretaceous, the main movements occurred during the Tertiary.

The strike-slip faults along the Cayman Trench, the Oca Fault and El Pilar Fault of Northern Venezuela are, therefore, rather young structural features and should not be projected into the Paleozoic or even the early Mesozoic.

9. The continental crustal block east of the ancestral Greater Antilles (Fig. 2) and between Florida and Venezuela was very likely the ancient crustal platform which later subsided slowly to form the foundation of the Bahamas. The enormous thickness of shallow water limestones and dolomites under the Bahama Islands accumulated on this platform from the late Jurassic until today.

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NOTICIAS

En la reunión mensual que se llevó a cabo el 27 de julio de 1967, el Dr. José A. Galavís habló sobre "Estudio geológico y evaluación preliminar de reservas potenciales de petróleo pesado en la faja bituminosa del Orinoco". Esta presentación, que en ocasión del recién Congreso Mundial de Petróleo en México constituyó el tema expuesto por el Dr. Galavís, fué seguida de una animada discusión por parte de los asistentes.

Durante los días 10, 11 y 12 de julio, el Dr. Daniel A. Busch, geólogo muy conocido, presentó un curso de pláticas patrocinado por la A.V.G.M.P. en conjunción con la A.A.P.G. El tema expuesto fué "Areniscas - Estratigrafía aplicada del subsuelo : Significación y métodos de reconstruir ambientes paleo-deposicionales". Más de cincuenta de los miembros asistieron a este curso que se relacionó con aspectos modernos de estratigrafía de alta importancia en la exploración de petróleo.

NUEVOS MIEMBROS

En la reunión del 4 de julio de 1967 la Junta Directiva aceptó a las siguientes personas como miembros activos:

MATOS RIVAS, José, geólogo, Corporación Venezolana del Petróleo, Maracaibo
NARVAEZ, Marcos, estudiante, Universidad Central de Venezuela, Caracas
SEITZ H., Gustavo, estudiante, Universidad Central de Venezuela, Caracas
TIRADO MORENO, Carlos, geólogo, Texas Petroleum Company, Mata
UJUETA LOZANO, Guillermo, profesor, Universidad Central de Venezuela, Caracas.