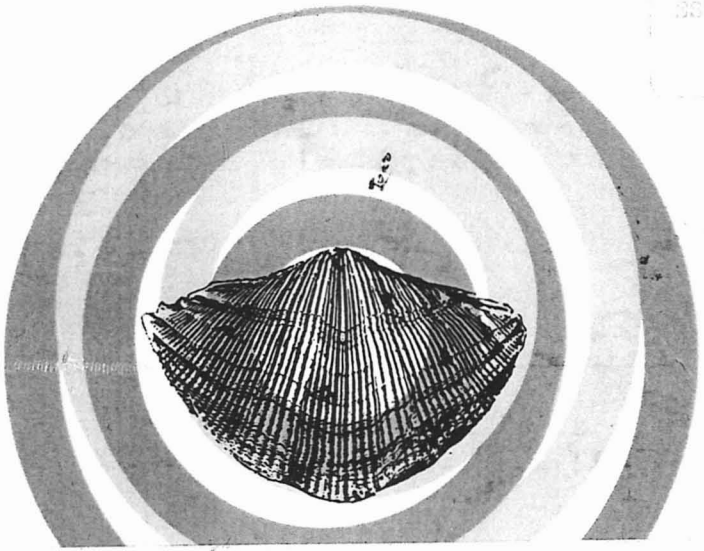
INTERNATIONAL SYMPOSIUM ON THE CARBONIFEROUS AND PERMIAN SYSTEMS IN SOUTH AMERICA



EXCURSION GUIDE-BOOK

EMIA BRASILEIRA DE CIÊNCIAS
STITUTO DE GEOCIÊNCIAS, USP
SÃO PAULO
BRASIL
1 9 7 2

Continental sediments and red-beds of the Passa Dois Group (P).
Road distance: ± 300 km.

Day 6th — November, 30 — **Start:** Londrina.
End: São Paulo.
Last day will be reserved only for trip back to São Paulo.
Road distance: ± 530 km.

Total road distance: ± 2,400 km

FIRST DAY — NOVEMBER 25th

São Paulo to Sorocaba, via Conchas.
Guide: A. C. Rocha-Campos

Road log prepared by: A. C. Rocha-Campos, P. R. dos Santos and A. R. Saad (Instituto de Geociências, USP).

Exposures of the northern facies of the Tubarão and Passa Dois Group will be examined along the road to Conchas.

Strata will be crossed roughly normally to strike and from bottom to top of the section. The exposures, although not continuous and in general poor, give a good idea of a representative profile of the northern part of Paraná Basin.

Glacial features and characteristics of diamictite bodies, as for instance, generalized absence of inclusions of deformed sandstone bodies indicate a predominance of tillite in the area of excursion.

Lacustrine and fluvial facies also occur represented by thick rhythmite bodies. In these, soft-sediment folding and load structures are common.

The post-glacial sequence in central São Paulo (Itapetininga Formation) differs markedly from the equivalent unit in the south (Guatá Subgroup), being thinner and with predominance of finer clastics. Subsidiary limestone beds occur.

The rocks of the Passa Dois Group in the excursion area are included in two units, the Irati and Corumbataí formations (= Estrada Nova Formation). Excursionists will have a good view of the typical northern facies of both units, with the Irati composed predominantly of dolomite and limestone intercallated with black shales, while the Corumbataí is formed by a sequence of fine clastics (red or violet siltstone and fine sandstone).

Departure time:	8:00 A.M.
Until Km 68.0	Cenozoic sediments of São Paulo Basin and basement rocks of the Açungui Group (Proterozoic).

Km 68.0	Small outlier of sandstone and conglomerate from the Itararé Subgroup (C-P) resting on phyllites of the Açungui Group.
Km 69.0-79.0	Basement rocks (phyillites and granite) of the Açungui Group.
Km 79.0	Isolated outcrop of Itararé Subgroup sandstone resting on basement rocks. Shale and rhythmite of the Itararé Subgroup.
Km 80.4	Entrance to secondary road to Itu. Turn right.
Km 64.3 (SP-79)	
Km 48	Itu
Km 37.3	**Stop for 30 minutes.** Entrance to roche moutonnée locality at Salto. One kilometer to the north on this road occurs the contact between glacial sediments of Itararé Subgroup (Itu Formation) directly overlying a boss-like structure of basement rocks (Itu granite, 450 m. y. old, intrusive in the Açungui Group). Diamictite, and stratified sandstone with dropped clasts of the Itu Formation overlie glacial abraded surface, polished and striated (average direction of striae N45° W). Quarrying of the pink granite destroyed the former morphology of the structure, which had to be recently excavated for examination of glacial features (Fig. 5). Return to Itu.

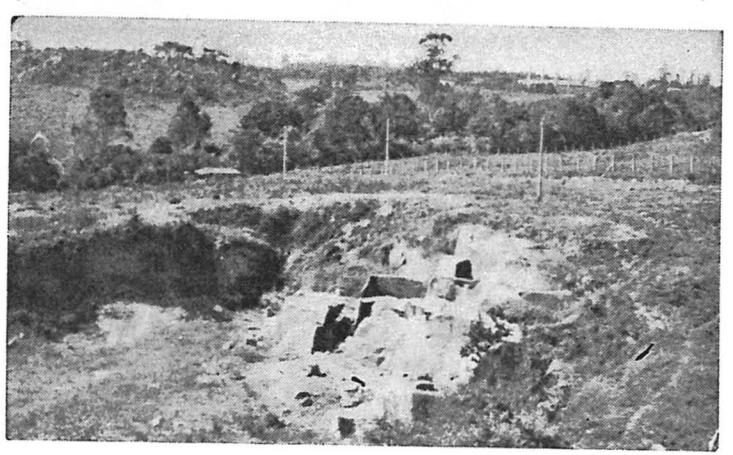


Fig. 5 — General view of the «rouche moutonnée» locality at Salto, São Paulo.

Stop for 30 minutes.

About 2,5 km from downtown Itu towards north, the party will examine a quarry exposing rhythmites of the basal Itararé Subgroup (Itu Formation), often called "varvites". Notable set of sedimentary structures including: clibbing ripple-marks, cross-bedding, gradded-bedding, etc. Rare dropped clasts. Numerous arthropod trails of different types. Note the thick sandstone beds at the base of the quarry and the band showing finer lamination near the top of the outcrop. Rhythmicity may represent glacial controlled variation, but not necessarily annual seazonal variation (Fig. 6).

Return to Itu and main road (SP-300).

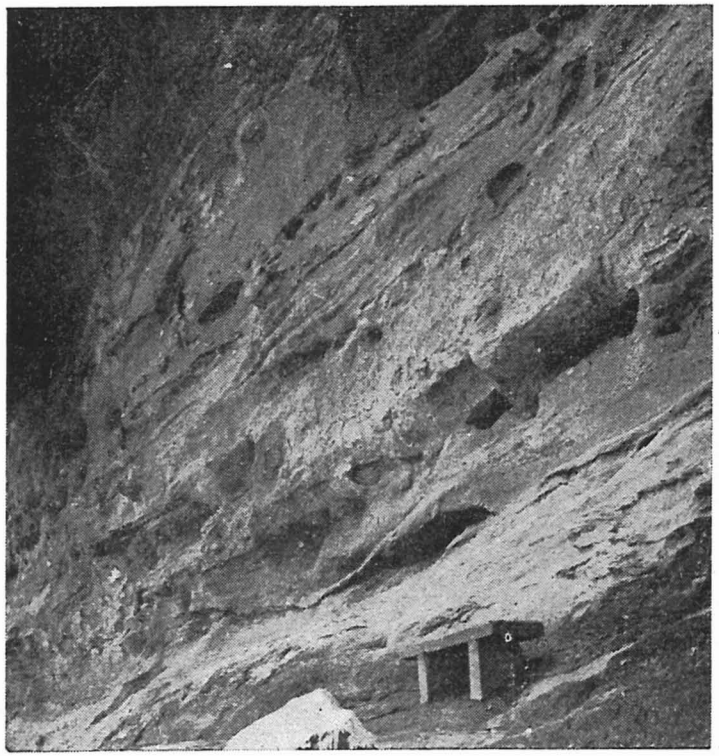


Fig. 7 — Sandstone and siltstone of the Itararé Subgroup outcropping at municipal park in downtown Porto Feliz.

FIG. 6

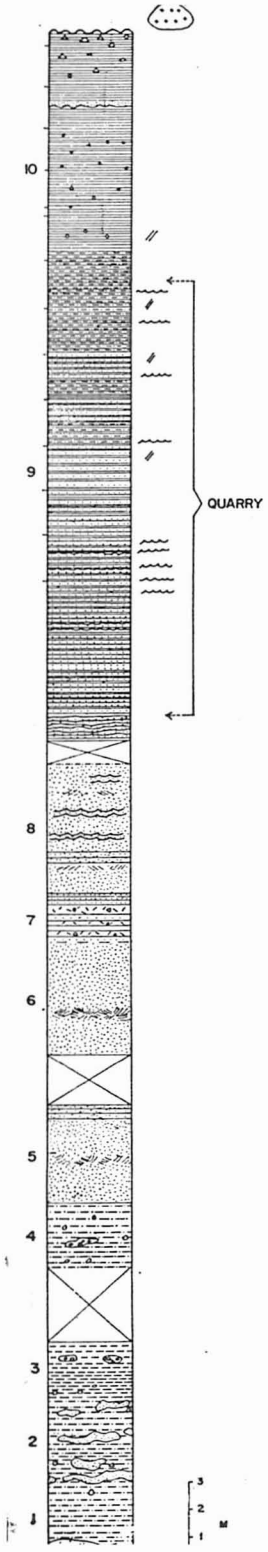


Fig. 6 — Section measured along the secondary road to the Itu quarry. Explanation: 1: siltstone; 2. siltstone with disrupted sand layers; 3: shale with dropped pebbles and conglomeratic lenses; 4: siltstone with dropped clasts; 5: fine sandstone, cross bedded; 6: fine sandstone; 7: stratified diamictite and sandstone; 8: fine sandstone, cross-bedded and with ripple marks; 9: rhythmite (shale, siltstone or fine sandstone) with ripple marks (undulated lines); trace fossils (parallel, oblique

FIG. 8

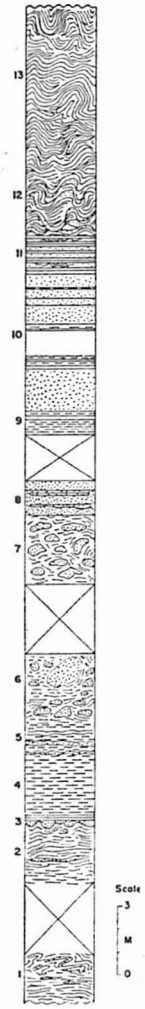


Fig. 8 — Section of Itararé Subgroup measured along cut on left side (downwards) of secondary road to Boituva, São Paulo (SP-300, km 137.7). Explanation: 1: horizontal and folded shale with sandstone masses and beds; 2: deformed shale and sandstone; 3: laminated shale overlying bed with load structures; 4: shale; 5: undulated shale and sandstone; 6: chaotic mixture of sandstone bodies in shale; 7: chaotic mixture of sandstone bodies in shale; 8: stratified sandstone; 9: shale; 10: thick bedded sandstone with sole marks, intercalated with siltstone; 11: siltstone and sandstone with internal convolutions; 12: rhythmite and sandstone chaotically folded; 13: folded rhythmite.

FIG. 9

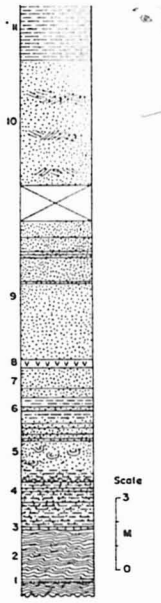


Fig. 9 — Section of Itararé Subgroup measured along cut on right side of road to Conchas at Córrego da Baronesa, Tietê, São Paulo (SP-300, km 159,9). Explanation: 1: siltstone; 2: fine sandstone with clibbing ripples; 3: limestone; 4: siltstone with load cast structures; 5: sandstone with convolute bedding; 6: siltstone; 7: sandstone; 8: diabase sill; 9: thick bedded sandstone; 10: medium to coarse, cross-bedded sandstone; 11: silty-shale.

Km 111.4 (SP-300) Return to Itu and main road
Glacial rhythmites of the Itararé Subgroup (Itu Formation).

Km 117.6 Bright-gray, sandy matrix diamictite.

Km 120.5 On the left road cut, gray-violet, diamictite, finely stratified and including sandstone bodies is cut by channel of coarse, feldspatic sandstone. Deformed strata inside the channel.

Km 121.1 Yellowish-gray, sandy, stratified diamictite with sandstone venules (pseudomorphs of ice-venules?), on the left side of the road.

Km 121.2 **Stop for 15 minutes.**
Bright-gray, sandy diamictite bellow brown shales and rhythmites ("varved shales").

Km 129.2 Entrance to Porto Feliz to the right.

Stop for 15 minutes.
Notable exposure of Itararé sandstone inside a municipal park in downtown Porto Feliz (Fig. 7).

Stop for lunch — 50 minutes
Return to main road (SP-300).

Km 133.1 West entrance to Porto Feliz.

Km 137.7 **Stop for 30 minutes.**
Road to Boituva at left. Starting at about 400 meters ahead and walking downhill, participants will examine a succession of complexely folded rhythmites and sandstones of the Itararé Subgroup. Several disturbed zones are separated by horizontal beds. Folding is interpreted as due to subaqueous slumping. Pinch-and-swell structures of sandstone beds, chaotic folding (with folded axis) of upper disturbed zone terminates abruptly against horizontal, coarse bedded sandstone ("décollement" surface?). Internal convolute bedding is visible in the first horizontal beds. Drag lineations occur on the sole of sandstone beds. Load-structures are common in lower disturbed zones. Fine arthropod trails and carbonized remains of plants on rhythmite beds (Fig. 8).

Km 143.6 Yellowish sandy diamictite and sandstone.

Km 150.8 Santa Candida.

Km 152.1 Greenish-gray, sandy diamictite.

Km 154 Bright-gray siltstone ("pelodite") intercalates with fine to medium grained sandstone. Load structures at the base of the sandstone beds.

Km 156.8 First entrance to Tietê.

Km 157.3 **Stop for 20 minutes.**
Large body of channel sandstone showing cross-bedding outcrops on both sides of road. Small oblique dyke cuts the sandstone at the eastern part of outcrop (Tietê Formation, Itararé Subgroup).

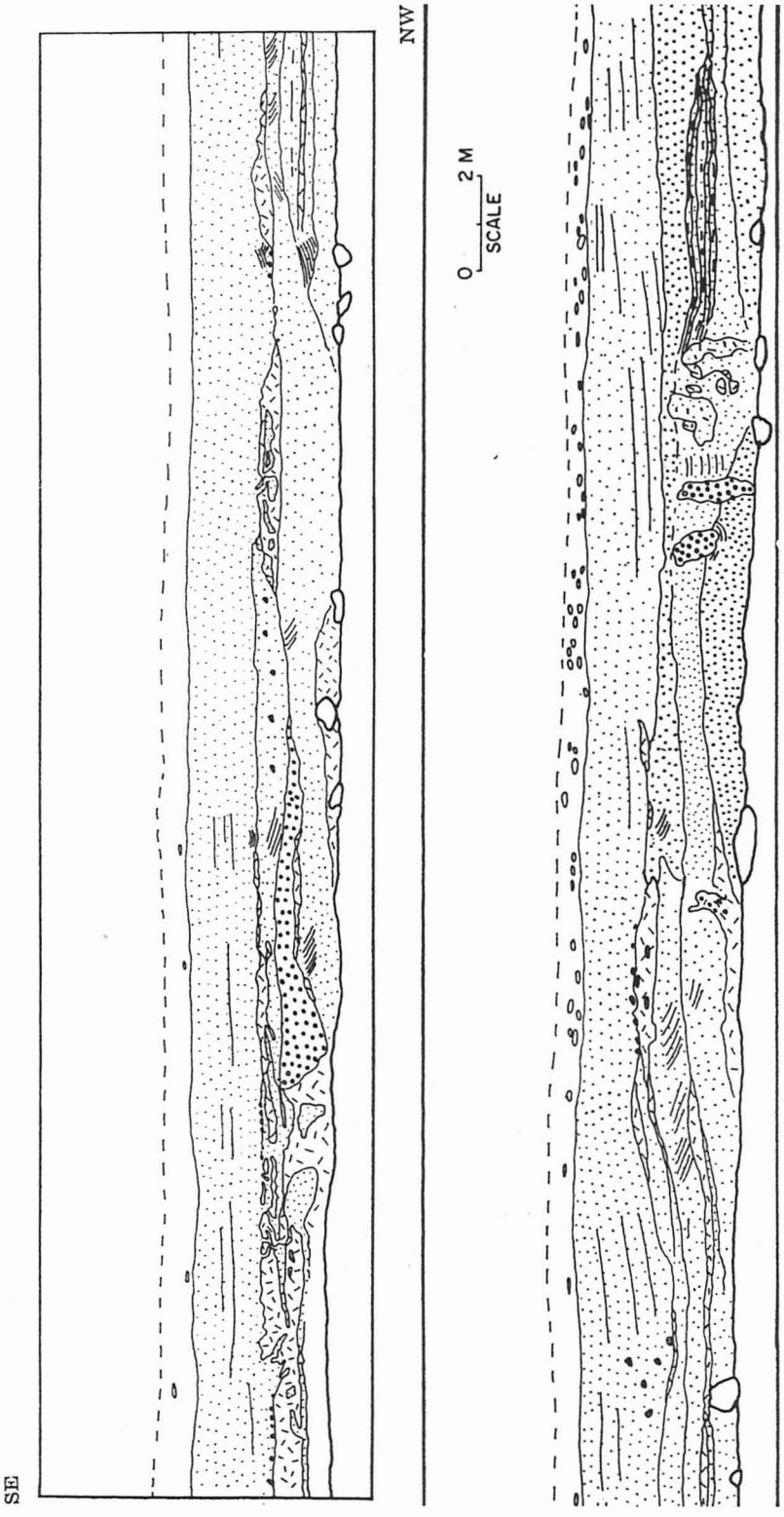
Km 158.2 Second entrance to Tietê.

Km 158.8 Yellowish sandstone of the Itararé Subgroup (Tietê Formation).

Km 159.6 Third entrance to Tietê.

Km 159.9 **Stop for 20 minutes.**
Baronesa creek. Excellent exposures of siltstone, limestone and sandstone of the upper Itararé Subgroup. Notable sedimentary structures: clibbing ripples, load structures showing passage between small scale sand pockets to ball-and-pillow and sand balls, with internal convolute bedding. A 40 cm thick diabase sill is intruded in the sequence (Fig. 9).

Km 167.6 **Stop for 30 minutes.**
Diamictite and sandstone of the upper part of the Itararé Subgroup on the left side of the road. In the lower part of the section, fine to coarse grained sandstone beds are interbedded with diamictite and cut by a small conglomerate channel. Bright-gray, sandy diamictite overlies the sandstone with aligned concentration of clasts and calcareous concretions near the contact. The aligned clasts seem to be part of a boulder pavement outcropping on railroad cuts about 50 meters to the north



g. 10 — Diamictite and sandstone of the upper Itararé Subgroup at Jumirim (SP-300, km 167.6). Explanation: blanck: diamictite; interpted line separates lower silty zone with calcareous concretions and clasts of the boulder pavement; fine dots: fine sandstone; coarse dots; edium to coarse sandstone; circles: conglomerate; dots and bars; siltstone; irregularly disposed bars: diamictite; lower area circunscribed coarse line: tallus.

(Rocha-Campos et al., 1969b). Note medium-gray, finer matrix zone at the lower part of the diamictite (Fig. 10).

Km 169.2 — Entrance to Jumirim. Contact between the upper Itararé with the post-glacial siltstone and sandstone sequence of the Tubarão Group (Itapetininga Formation, Barbosa and Almeida, 1943, or Tatuí Formation of Rocha-Campos, 1967).

Km 171.6 — Entrance to Laranjal Paulista.

Km 173.6 — Reddish sandstones and siltstones (Itapetininga Formation).

Km 174.4 — Reddish sandstones and siltstones (Itapetininga Formation).

Km 176.4 — Entrance to Laranjal. Weathered, greenish sandstone and siltstone and medium gray, fine sandstone of the upper part of the Tubarão Group (Itapetininga Formation) outcrop on both sides of the road.

Km 177.4 — First identifiable outcrops of Irati Formation (P), lowermost unit of the Passa Dois Group.

Km 181.3 — Maristela.

Km 185.6 — **Stop for 30 minutes.**

Entrance to the Irati Formation, quarry 400 meters from main road. Excellent exposure of the northern facies of Irati Formation, with lower bed of dolomite ("Banco"), 2m thick, exploited commercialy as corrective of soil acidity, followed up by rhythmic alternation of dolomite and black shales beds. Both shale and dolomite are pyrobituminous. Syngenetic and epigenetic silicification is extensive, forming bizarre shaped concretions. Intraformational conglomeratic beds in the dolomite. Rare remains of the mesosaurid. **Stereosternum tumidum** Cope and crustaceans **(Liocaris). Take care with loose rocks!** (Fig. 11).

Km 189 — Entrance to Pereiras.

Km 193 — Western entrance to Laranjal Paulista to the left. Horizontal topped hills in the background are supported by upper chert beds of Corumbataí Formation.

Km 193.8 — Entrance to Conchas to the right.

Stop for 30 minutes.

Fresh exposure of violet shale, siltstone, sandstone, limestone and chert of the Permian Corumbataí Formation on both sides of road. This unit is considered equivalent to the Estrada Nova Formation (Passa Dois Group), of the southern part of Paraná Basin. Small scale sedimentary structures include fine stratification and mud-cracks. Fossil sphenopsida, coelacantid scale and teeth may be found on lower siltstone and shales. Small silified bivalves occur in the upper chert beds (Fig. 12). Collectors may try their luck examining loose chert blocks at the top of the section on the left side, across the fence. **Beware of chert fragments when breaking blocks!** (Fig. 12).

Km 194.7 — Violet siltstone with several chert bands at the top.

Km 195.4 — Other outcrops of violet siltstone and of limestone beds of the Corumbataí Formation.

Km 196.3 — Violet siltstone of the Corumbataí Formation.

Km 196.4 — Western entrance to Conchas.
From this point participants will return directly to Sorocaba for the night stop.

Km 80.2 (SP-280) (Km 67.4, SP-79) — Entrance to Sorocaba. Turn right to Sorocaba, via road SP-79.

Km 83.2 — Sorocaba. Overnight stop.

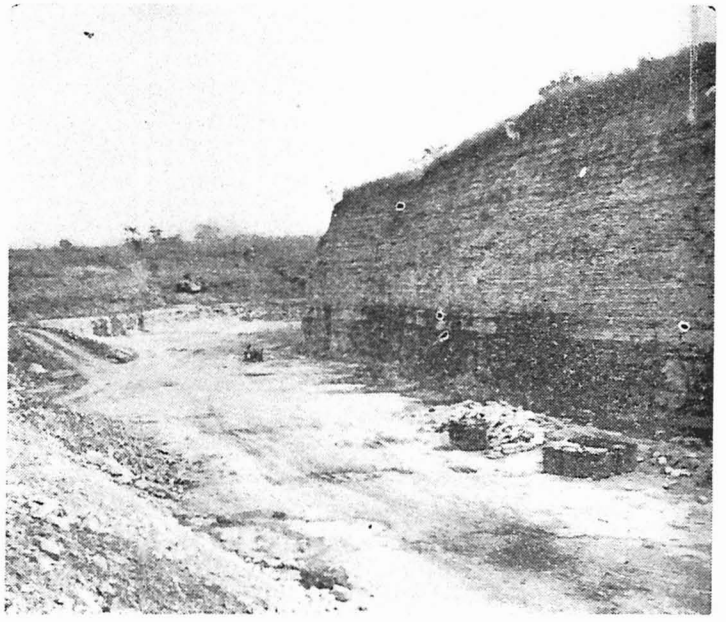


Fig. 11 — Irati Formation outcropping in a quarry at Pereiras (SP-300, km 185.6). Note lower calcareous bed and upper rhythmic alternation of black, bituminous shale, limestone and dolomite.

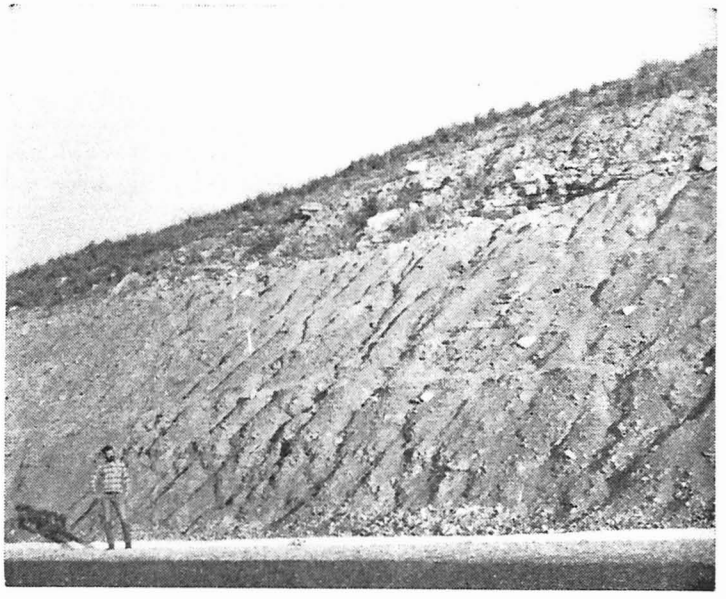


Fig. 12 — Corumbataí Formation outcropping on road cuts near Conchas (SP-300, km 193.8).