CALCULATION OF THE ATTITUDES OF FOLDED
BEDS PRIOR TO SUBSEQUENT TILTING

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Frequently the geologist is faced with the problem of trying to re-construct the structures and attitudes of a series of sediments that have been folded, then covered by another sequence of sediments and later subjected to other periods of folding. This precisely is the problem facing those who work with the Eocene sediments in Lake Maracaibo. The Eocene formations were complexly folded, peneplained and covered with Oligocene to Pliocene sediments. The entire series was folded at the end of the Pliocene and again during the Pleistocene.

In order to determine the structural features, the irregularities of the unconformity surface and the sub-outcrop pattern of any older beds that have been covered by later deposits, it is necessary to find the attitude of the older beds when the overlying younger beds were flat lying. In some cases the paleo-dips can be estimated with sufficient accuracy but in other cases they must be calculated.

There are three or four methods by which the dips prior to tilting may be calculated: by use of a stereo net, by geometry (a lengthy method), and by solid geometry.

The purpose of this note is to present one method by which the problem can be solved simply. Although a stereo net solution has been published, the printed answer given on page 195 is inexact, which is very confusing to anyone working the problem for the first time. For that reason and because of a request to solve the Eocene problem, the following equations are presented:

Problem: Given the present attitudes of two beds, one below an unconformity and the other above, find the attitude of the older bed when the younger one was flat (being deposited).

Notation:

- $a$ = present dip of older bed
- $b$ = dip of younger bed
- $M$ = azimuth of dip $a$
- $N$ = azimuth of dip $b$
- $c$ = original dip of older bed prior to tilting
- $Z$ = azimuth of dip $c$
- $C$ = smaller angle between $M$ and $N$ ($C$ is less than $180^\circ$)
- $Q$ = angle between $N$ and $Z$

1. Manuscript received October 1961
2. Consultant, Apartado 709, Caracas
3. “Structural Methods for the Exploration Geologist” by Peter C. Badgley. The line A′-A′ on his figure 231, page 197, is incorrectly drawn. The stereo net method, when properly performed, gives correct answer.