INTERNATIONAL EXPLORATIONIST GROUP EVENING MEETING—APRIL 15, 1987

ALBERT W. BALLY—Biographical Sketch

Albert W. Bally was born in April, 1925 in the Hague, Netherlands and spent his early years in Indonesia, Italy and Switzerland. He received a Ph.D. degree in geology from the University of Zurich in 1953. An area of the central Appennines was the subject of his thesis. While at the University, he worked for Gulf Oil and mapped the Ragusa Plateau of SE Sicily. Further work involved detailed mapping for hydroelectric power projects in the area of the Penninic nappes and their rootzone in southern Switzerland. This was followed by post-doctoral work at the Lamont Geological Observatory of Columbia University in 1953-54 involving the study of deep-sea sediments.

Dr. Bally was employed by Shell Canada in 1954. He was first involved in an exploration program on the Rocky Mountains and foothills of Alberta, followed by a large-scale reconnaissance project in the Northwest Territories and Yukon. As Chief Geologist from 1962-66, he was concerned with all Canadian exploration matters, but particularly with offshore programs on the Canadian east and west coasts and in the Northwest Territories.

In 1966, he was transferred to Houston as Manager of Geological Research at Shell Development Company. He was appointed Chief Geologist U.S.A. for Shell Oil in 1968, a position he held until January, 1975. During this time, he was involved in exploration in the U.S. both offshore and onshore and, since 1972, mainly with the study of global geology as well as more detailed studies in the Western Cordillera and the sedimentary basins of the U.S. In August, 1980 he became Senior Exploration Consultant for Shell Oil.

On July 1, 1981, Dr. Bally was appointed the Harry Carothers Wiess Professor of Geology and Chairman of the Department of Geology at Rice University. In 1982, he received the William Smith Medal of the Geological Society of London. He was editor for the three volume "Seismic Expression of Structural Styles - A Picture and Work Atlas" which was published in 1984 by the AAPG. In 1986, he received the Honorary Membership of the American Association of Petroleum Geologists. In 1987, he received the Gustav Steinmann Medal of the Geologische Vereinigung (Germany). He currently edits an atlas on Seismic Stratigraphy to be published by AAPG.

BALANCED SECTIONS AND SEISMIC REFLECTION PROFILES ACROSS THE CENTRAL APENNINES, ITALY*

Balanced cross sections combined with AGIP's magnetic survey analysis clearly show that the Central Apennines can be interpreted using experience gained in Western Canada and Wyoming.

Having stated that the Rocky Mountain model in general works in Italy, we feel we have to emphasize some major differences.

The reflection seismic data in the Apennines and the Adriatic foreland do not permit us to recognize a continuous near basement reflector. Consequently, we have to assume a gently westward dipping decollement surface. This surface, our putative basement, is visually extrapolated from the Adriatic foreland toward the west and underneath the Apennines. The probable reason for the near absence of a "basement" reflector is due to the nature of the basement and possible absorption of seismic energy by Triassic evaporites.

In contrast to a number of other folded belts, the structure in the Apennines is dominated by the distribution of Triassic evaporites. Thus, the best analogues for the Apennines are probably the Zagros Mountains and to a lesser extent the Parry Island folded belt of Northern Canada and the Jura Mountains. Seismic data from the Zagros is scarce but seismic data from the Parry Islands and the Jura Mountains clearly demonstrate an evaporitic decollement level.

The geology of Italy is further complicated by Jurassic extensional tectonics. Jurassic extension has been postulated on the basis of surface studies in the Southern Alps and in the Apennines. The arguments favoring extension are mostly based on stratigraphic observations. We have as yet to document anything coming near a description of a Jurassic structural pattern. We suspect that such a pattern would reveal a system of listric half-grabens, that are connected by transform segments. Unfortunately, there is not a hint of any evidence of Jurassic extensional tectonics on our reflection seismic profiles or else possibly to the limitation of widespread extensional tectonics to the outcropping Sibillini thrust sheet and their general absence in the Adriatic foreland. The situation in the Allochthonous thrust sheet may also be compared with the reefal buildups in the central Adriatic Sea and in the Abruzzi, which are not demonstrably controlled by any pre-existing extensional tectonics.

Additional widespread decollement levels can be observed on the surface (base Messinian, Scaglia Cinerea, Scisti a Fucoidi, Rosso Ammonitico, and many other minor levels). All these cannot be resolved by conventional reflection seismic profiles. We choose to ignore these features. Consequently, the amounts of shortening shown on our cross sections are conservative and much of the shortening observed in detailed studies should be added to the large scale regional shortening suggested by our profiles.

The main decollement level descends from about 5 km under the Adriatic Sea to about 15 km under the Central Apennines. Regionally farther west, it is likely that the main decollement level is close to the Moho. This implies that basement and sediments are separated mechanically from the underlying mantle. That mantle would form a lithospheric A-subduction related root, the existence of which still needs to be demonstrated.

The Anzio-Ancona line, or at least the Terminillo-Sibillini segment of that feature is interpreted by us as a lateral ramp.

The Sibillini thrust appears to have been rotated counter clockwise as postulated by paleomagnetic workers. Much of the increased shortening in the south of our area is due to the appearance of N-S striking duplex structures; a)

the Roccafinadamo structure, b) the Montagna dei Fiori structure, and c) the Laga (Aquasanta) thrust sheet.

Our palinspastic reconstructions are crude first approximations. They suggest that the Sibillini thrust in its reconstruction coincides reasonably well with the present-day position of the leading edge of the Cervarola thrust sheet. With it, the Umbrian domain falls to the present day Toscana and the adjacent Tyrrhenian sea, the Cervarola unit falls in its reconstruction to the northwestern Tyrrhenian sea, while the Tuscan units would position in the area now occupied by Corsica and the Eastern Gulf of Lyon (Provencal Basin).

We speculate the basic structural style of the Dinarides to be similar to the style of the Central Apennines to the extent that a major Triassic evaporitic decollement level appears evident. Utilizing similar palinspastic restoration techniques, we suggest that the original Adriatic promontory was well over 1200 km wide.

**This project was undertaken in cooperation with C. Cooper, Rice University, L. Burbi and R. Ghelardoni, AGIP, Spa, San Donato, Italy.*