DINNER MEETING—MAY 14, 1984

DONALD C. SWANSON—Biographical Sketch

Donald C. Swanson is a partner in Swanson Petroleum Enterprises (which provides technical services to Venezuelan companies) and Swanson and Crow (an independent exploration company) as well as President of Cygnet Group Inc. He received a B.S. degree in General Arts and Sciences from Colorado State University, a B.S. degree in Geology from the University of Tulsa, and did graduate studies at the University of Oklahoma. Before forming his own companies, he spent 29 years with Exxon — 15 years in operations and 14 years at the Exxon Production Research Center. While at Exxon he organized and taught classes in a wide range of subjects including clastics, reservoirs, logging, and computer applications. These classes were held at various sites in the U.S. as well as in Venezuela and Colombia. He continues to teach industry classes in clastics and exploration techniques through Swanson Petroleum Enterprises.

Mr. Swanson is a leader in the utilization and application of integrated stratigraphic and facies analysis to both exploration methodology and reservoir studies. He is considered to be an authority on the petroleum geology of the Anadarko Basin and the geology of Venezuela. He has done detailed reservoir studies of fields in the U.S., Netherlands and Venezuela and has published papers on a wide range of subjects within Exxon and his own company, as well as in AAPG bulletins, memoirs and special publications, in local geological society bulletins, in "World Oil" and in "Shale Shaker".

Mr. Swanson has made presentations of technical papers to numerous professional societies in Texas, Oklahoma, California, Kansas, Wyoming, Louisiana, Colorado, Venezuela and Colombia as well as to the national AAPG meetings. He has received many professional honors and acknowledgements including the A. I. Levorson Award from AAPG for best paper in 1968 and 1979. He is a member of the Explorer's Club, the American Association of Petroleum Geologists, the American Association for the Advancement of Science and is a fellow of the Geological Society of America.

APPLICATION OF INTEGRATED RESERVOIR ANALYSIS TO DESIGN OF A WATERFLOOD PROJECT IN MIOCENE LL3 FIELD, LAKE MARACAIBO, VENEZUELA

Integrated Reservoir Analysis is a procedure in which intepretated stratigraphic and facies frameworks are combined with structural maps. The result is a three-dimensional interpretation of the thickness, shape, lateral external and internal distribution of porosity and permeability in individual reservoir units. The principal steps of the procedure are: (1) planning, (2) data gathering, (3) determination of the stratigraphic framework, (4) determination of the facies framework, (5) structural analysis, (6) data manipulation, and (7) mapping.

The stratigraphic framework is developed by combining pattern correlation techniques with knowledge about the influence of specific facies on stratigraphic patterns. A network of cross sections are designed utilizing correlation "grain" and/or depositional strike. Correlations on these sections develop a framework of horizons which ideally will isolate, in a stratigraphic envelope, individual reservoir units resulting from a unique depositional episode.

The facies framework results from environmental facies analysis and the use of electric log facies. The proper identification of reservoir facies is required for the mapping of reservoir geometry and the determination of the internal distribution of porosity and permeability. Facies-biased contouring techniques and the lateral extension of facies relationships along cross sections were used in the planning and design of a waterflood project by Lagoven, S.A., in fluvial-deltaic clastics of the Miocene La Rose Formation in the LL3 field, Lake Maracaibo, Venezuela. Important clastic reservoir facies recognized in cores were (1) stream-mouth-bar, (2) distributary-channel-fill, and (3) fluvial-point-bar deposits. These environmental facies often occurred in various combinations in deltaic lobes and displayed the electric log shape of the deltaic couplet. Characteristic electric log shapes of specific reservoir facies were an essential part of the study.

The pilot waterflood was designed to inject into stream-mouth-bar facies and withdraw from centrally located distributary-channel-fill deposits with their better porosity and permeability. Critical to the design and subsequent performance of the waterflood project were (1) the distribution of porosity within the various reservoir facies, and (2) the occurrence, attitude, and lateral distribution of clay laminations in lower stream-mouth-bar facies which was particularly critical to waterflood treatment. The amount of masking was determined by calculations from facies geometry. After one year's operations, radioactive tracers indicate that the flood is operating as designed - only at a reduced rate - probably as a result of the clay laminations.