INTERNATIONAL EXPLORATIONISTS GROUP EVENING MEETING FEBRUARY 17, 1988

JOHN R. CASTANO—Biographical Sketch

John R. Castano is a consulting geologist and geochemist in Houston, Texas. A native of New York, New York, he served in the U.S. Army for two years and then received a B.S. degree in geology from Northwestern (1950).

After leaving Northwestern, he worked for Shell Oil for 36 years until his retirement in 1986. Mr. Castano began as a stratigrapher in Casper, Wyoming, and then worked for a year in the Research Laboratory in Houston as an assistant to Rufus LeBlanc, Bob Nanz and Ted Philippi. For the next nine years he worked in Bakersfield, California, as the Special Problems Geologist; during this time he was one of the first Shell geologists to work on turbidites in the field and subsurface. Based in Seattle and then in Los Angeles, Mr. Castano worked mostly on Alaska until 1973. Initially he conducted stratigraphic and petrologic studies, which involved about six months of field work. He also began to do source rock and oil geochemical studies, and from 1969 onward devoted most of his efforts to them. He started vitrinite reflectance analysis for Shell in 1967, and when Shell consolidated its activities in Houston in 1973, he set up the Geochemical Services Lab at the Bellaire location and was in charge of this group until 1984. In that capacity he was responsible for carrying out the geochemical service work for Shell in its worldwide operations. In his last two years at Shell he was involved in several geochemistry research projects.

After retiring from Shell as a Senior Staff Geologist, he immediately went to work on the Siljan project in Sweden, where he has been the onsite chief scientific officer.

Mr. Castano is the author of more than twenty papers and owner of one patent. He is a member of many professional societies including HGS, AAPG, SEPM, and GSA. He was one of the founders of the Society for Organic Petrology and served as President in 1986. He has served on AAPG and SEPM committees for many years; at present he is a member of the AAPG Research Committee and was responsible for initiating the Regional Cross-Section project. Mr. Castano is on the Editorial Board of *Coal Geology* and is a member of the International Committee for Coal Petrology.

SILJAN WELL, SWEDEN: DRILLING FOR ABIOGENIC GAS IN AN IMPACT STRUCTURE

The Gravberg-1 well is situated in an area of central Sweden known as the Siljan Ring structure, which was formed as the result of a meteorite impact 360 million years ago. The well is being drilled as a commercial venture by Vattenfall, the Swedish State Power Board. The objective is to explore for abiogenic deep mantle gas in the crushed granite bedrock in the crater. The only rock types encountered thus far are granitoids and diabases of pre-Cambrian age. The well was suspended in September 1987 at a TVD of 6337 meters.

Pre-drilling investigations in the area revealed an anomalous geophysical structure in the upper 8 km with many low amplitude reflectors, both dipping and subhorizontal. A circular gravity minimum of about 40 km in diameter is centered on the drill site. Diabase sills, fine grained granite intrusions and fracture zones all contribute to the surface geophysical expression.

The scientific sampling program coordinates sophisticated measurements made at the well, with a group of eight laboratories performing various analyses. At the well, hydrocarbon gases are monitored by three different systems, each offering particular advantages. Inorganic gases, hydrogen, carbon dioxide, nitrogen, oxygen, helium, radon and hydrogen sulfide are also measured at the well. Many devices were redesigned in order to obtain the precise data required for the project.

The offsite laboratories analyze gas and mud samples, canned cuttings (for headspace and desorbed gas analyses) and dried cuttings. These analyses parallel the ones done at the well and also include the isotopic compositions of methane, ethane, propane, deuterium and helium.

Study of the cuttings at the well site includes a lithologic description. Special emphasis is put on rock characteristics that affect porosity and permeability and indicate the potential presence of a reservoir. The lithologic study is also geared to describe elements that affect a tie to wireline logs. A mineralogical point count analysis helps in the identification of changes in rock type.

Inorganic rock analyses include the typical petrographic and x-ray studies and major and trace element analyses. These data permit us to make a subdivision of the granites into several major types. Fluid inclusion studies show that the latest hydrothermal event postdates the impact. In progress are radiometric age dating studies aimed at dating the granites, diabases, the melts associated with the meteorite impact and the age of the fracture zones and hydrothermal events. We find that K/Ar, Ar/Ar and Pb/U dates were not reset by the heat generated from the impact event.

Two types of hydrocarbon gases were found. A fairly dry, methane-rich gas is present in the diabases; these are the major gas shows. In the granites, the methane content is 50-70%, and the gas includes a fairly high concentration of ethane and propane. The diabase gases are almost lacking in unsaturates, while in the granites the olefins are in equal amounts with the saturates. The diabases contain isotopically heavy methane (delta C13 of -10 to -24 per mill), similar to abiogenic gases found in the East Pacific Rise. In the granite, the methane is lighter (delta C13 generally -23 to -36 per mill). The origin of the gases in the granite is not clear at this point in the study.

Hydrogen is a prominent part of the gas mix. It is usually present in concentrations exceeding methane by about an order of magnitude. Helium is found largely below 6 km; isotopic studies show that it is crustal in origin.

The character of the mud system has a major impact on the quantity and quality of hydrocarbon shows.