upper parts of depositional units, paleosol-associated cements are common; caliche crusts, rhizocretions, needle-fiber cement, and lath-crystal cement are present. Phreatic-type cements are present, but generally are unimportant volumetrically. A reconstruction of the Pleistocene paleohydrology of the atoll indicates that the section has occupied the meteoric-vadose environment during emergent periods. The similarity of Pleistocene limestones beneath Enewetak and other Pacific atolls studied by drilling suggests that, for many atolls, most alteration of shallow subsurface Pleistocene limestones has occurred in the meteoric-vadose diagenetic environment.

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Analysis of Hydrocarbon Distribution and Finding Rates Throughout United States Sedimentary Basins

These are interim results of a comprehensive long-range study of hydrocarbon distributions in the various sedimentary basins of the United States utilizing the computerized LORENDAS exploration data base. This data base, developed over the last 5 years, includes an exploratory well file, an oil field file, and a gas field file; together, they contain the principal statistical elements of exploration histories, as well as sedimentary volumes by depth zones, for each sedimentary basin in the United States. These data have been used to investigate correlations (1) between exploratory drilling density and observed oil field and gas field size distributions, accounting for depth and geologic setting; and (2) between cumulative exploratory drilling and discovery rates.

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World Oil Resource Assessments and Relation to United States Oil History

Over the last 30 years, there have been about 2 dozen assessments of world oil resources. These may be reduced to about a dozen independent assessments, based on various methods such as historical statistics, geologic analogy, etc. In 1977, there was a major contribution, the Delphi study (27 experts), for the Conservation Commission of the World Energy Conference. A detailed analysis of the answers to the Delphi poll leads to better understanding of the many factors which influence future world oil availability.

The role and relation of the United States are of particular interest. First, most of the assessments have been made by U.S. experts, and a major share of the world geologic expertise belongs to major U.S. companies. Second, because of its maturity, U.S. oil history is most often used as a model for other countries and/or world regions (this was implicitly used in the conclusions of the Delphi results to calculate possible world oil production curves). So, the opinion we have of real long-term oil potential of the United States heavily influences all the assessments regarding world oil resources.

However, it is also interesting to investigate what could be the results of various values of world oil resources on the future U.S. oil situation.

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Current Estimates and Methods of Potential Gas Committee

The Potential Gas Committee is the only group specifically organized for the exclusive purpose of estimating the potential future supply of natural gas in the United States. It is composed of about 120 people—geologists, engineers, and others from industry, government, and academic institutions. They have developed methods, definitions, and guidelines for making the estimates. The genius of the committee is the expertise of its individual members and their access to highly classified information not available elsewhere. No other group—corporate, academic, or governmental—has the experience, insights, and specific knowledge of the geology and future gas potential that this committee possesses collectively.

The potential gas supply is that volume of gas believed to exist in addition to proved reserves—gas not yet discovered by the drill. The Committee's estimates are based on intensive investigations covering the lower 48 states and Alaska. All potentially productive areas and geologic formations are considered. All available geologic data are included in the studies.

The basic technique is the comparison of factors that control known occurrences of gas with factors present in prospective areas. The estimates are divided into three categories—probable, possible, and speculative—which reflect the relative degree of geologic knowledge and exploratory data available.

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Gas Versus Oil in Far East and Middle East

The Far East, including Australia, is largely a gas province (the USSR and China are excluded from our study). The Middle East is largely an oil province with respect to Tertiary and Mesozoic reservoirs, and a gas province with respect to lower Mesozoic and Permian reservoirs. The geologic and geochemical parameters which determine the predominance of gas over oil or oil over gas are well known. They include type of source rock, source rock position in the total sedimentary sequence, burial history, temperature gradients, timing of hydrocarbon generation, and trap formation, retention, and related geologic factors. In the Far East, the relation between coal or coaly matter as source rocks and the occurrence of natural gas is obvious. Australia is a striking example. In the Middle East, the Sargelu formation is one of the most prolific source rocks. It is of Middle to Late Jurassic age, kerogenous and fully marine, which, in combination with other factors, explains the predominance of oil in Tertiary and Mesozoic reservoirs in and around the Arabian Gulf. At deeper stratigraphic levels, huge quantities of gas are ascribed to Paleozoic sources, the nature of which has not yet been fully assessed. Much of this gas, especially in southwest Iran, can be regarded as thermally degraded oil.

In areas of intense Neogene deformation (Tertiary basins of Indonesia and Burma), a large part of the gas phase has probably escaped, whereas the oil phase was largely retained. Many examples illustrate the validity