

rich record of Pleistocene-Holocene events of both sub-aerial and subaqueous nature. In addition to clarifying the history of modern shelves, aerial patterns of quartz grain shape variation can be carried into the stratigraphic record, thereby allowing a more detailed paleogeographic-paleoenvironmental reconstruction.

RIGHTMIRE, C. T., and H. H. RIEKE, TRW, Inc., and W. H. FERTL, Dresser Atlas, Houston, TX

Resource Evaluation of Gas-Bearing Coal Beds

Bituminous and subbituminous coal deposits in the United States are a significant fossil fuel resource. Furthermore, a large methane gas resource is trapped in these coal beds and associated strata.

Distribution and resource assessment of these potential gas reserves in 380,000 sq mi (988,000 sq km) of coal-bearing strata is currently under investigation. Diagnostic techniques include regional and local geologic studies, mud log evaluations, geophysical wireline logging with associated digital interpretation in both open and cased boreholes, conventional and sidewall core analyses, drill-stem and production testing, and coal bed stimulation techniques.

Integration and analysis of the resultant data provide valuable information as to coal bed thickness, coal rank, ash and moisture content, coal permeability, face and butt-crest orientation, gas content, pressure, and flow potential. Overburden characteristics and the elastic rock properties of the floor and roof rocks, such as Young's modulus, bulk modulus, shear modulus and Poisson's ratio, are determined from logging techniques and provide information important to mine design, mining operation, stimulation of gas-bearing coal beds, and in-situ coal gasification projects.

RITZMA, HOWARD R., Utah Geol. and Mineral Survey, Salt Lake City, UT

Migration and Entrapment of Petroleum—Examples from Utah Oil-Impregnated Sandstone Deposits

Utah contains more than 50 deposits of oil-impregnated rock ranging in size from tiny patches to areas covering hundreds of square miles. These deposits are estimated to contain a total of 22.9 to 29.3 billion bbl of oil.

The following deposits are discussed, with illustrations and samples displayed. (1) South margin of the Uinta basin (P. R. Spring, Hill Creek, and Sunnyside deposits)—complex of deltaic sands impregnated with oil which is migrating out of the Uinta basin. Entrapment is controlled by thickness, volume and permeability changes in the reservoir; buoyancy of oil; regional structure; and jointing. (2) Central Uinta basin (Chapita Wells and Pariette deposits)—oil migrating up vertical gilsonite veins and outward into adjacent porous fluvial channel sandstones. (3) North flank of Uinta basin (Tabiona deposit)—pale yellow, live oil seeping up vertical sandstone beds in a structurally complex area, migrating across an unconformity, and accumulating as a black "tar sand" in basal sandstone above the unconformity. (4) Central southeast region (Tar Sand Triangle and Circle Cliffs deposits)—giant "fossil" oil fields on

flanks of major uplifts exposed by erosion. The Tar Sand Triangle with 12.5 to 16.0 billion bbl in place in the Permian White Rim Sandstone is the largest tar sand deposit in the United States. The Circle Cliffs deposit contains 1.3 billion bbl of oil in the middle (Torrey sandstone) member of the Moenkopi Formation (Triassic).

At their present location, Utah's oil-impregnated rock deposits may still be migrating toward a trap or to seepage and dissipation. Some deposits are active seeps indicating untapped oil reservoirs at an unknown vertical and horizontal distance.

ROBERTS, W. H., III, Gulf Research and Development Co., Houston, TX

Common Factors Among Atypical Fields

Several common factors are functionally relevant to the occurrence of typical as well as atypical oil and gas fields. Attention is focused on the more clearly atypical fields.

We may observe an apparent relation between the presence of oil or gas and certain geologic or geochemical factors without determining the true causality of that relation (which could involve other vital factors unperceived). Thus, our conclusions can be founded on mere coincidence and, once reached, those conclusions may carry a lot of momentum.

Some pertinent criteria of effective entrapment which can be examined in both typical and atypical fields are: upward reservoir convergence; differential compaction; stratigraphic shunting; deep-water discharge; structural coherence; minimum potential energy; local cover weakness; hydrothermal chimneys; near-vertical faulting; and hydrochemical plumes.

At this stage in our knowledge about petroleum occurrence we can probably learn more from the "atypical" than from the "typical," because some of our tacit assumptions are challenged. The atypical situation forces us to answer new questions. The new answers then may enable us to fine-tune the search for more dependable oil and gas prospects—typical or otherwise.

ROBINSON, GRAY S., and BARRY KOHL, Cheron U.S.A., Inc., New Orleans, LA

Computer Assisted Paleocologic Analyses and Application to Petroleum Exploration

Several computer programs used in the oil industry help provide rapid, reliable, and consistent paleocological interpretations of paleontologic and lithologic data from wells drilled in the silico-clastic regime. Some of the more significant programs are described and their value to the exploration program is demonstrated.

The basic input is the coded description of the fossil and lithologic constituents of washed well samples described by paleontologists. The output is a basic, detailed paleontologic well log, plus several additional products, including paleocologic logs and displays.

The basic paleontologic log consists of a sample-by-sample, coded, quantitative listing of fossil identifications and lithologic content of the entire well plotted to a vertical scale, usually 1 in. = 100 ft (1 cm = 76 m).