subsidence gave rise to widespread multistoried sheet sandstones up to 50 m thick.

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Depositional Facies and Uranium Occurrence, Triassic (Dockum Group), Texas Panhandle

Late Triassic (Dockum Group) rocks accumulated in relict Paleozoic basins bound by the Amarillo uplift on the north and the Glass Mountains on the south. Basins were reactivated by late Paleozoic or early Mesozoic tectonic activity that created the Gulf of Mexico.

More than 2,000 ft (600 m) of terrigenous clastics, derived mostly from older sedimentary rocks, accumulated within the basin. Source areas were in Texas, Oklahoma, and New Mexico. The Dockum Group accumulated in a variety of depositional systems including (1) braided and meandering streams, (2) alluvial fans and fan deltas, (3) highly constructive lobate deltas, (4) lacustrine systems including ephemeral and relatively long-lived lakes, and (5) mud flats.

Dockum sedimentation was cyclic, a reflection of alternately humid and arid climatic conditions. During humid climatic conditions lake level was relatively stable. Meandering streams supplied sediment to high-constructive lobate deltas in the central basin area; braided streams and fan deltas were dominant depositional elements within southern and northern basin areas. During arid climatic conditions base level was lowered, stream valleys evolved, and small fan deltas developed along ephemeral lake margins; evaporites, calcretes, silcretes, and soils developed on floors of ephemeral lakes and on delta platforms.

Uranium occurs within about 25 depositional facies. Highest uranium values are in lacustrine facies which developed under arid climatic conditions. Channel-lag facies of meander-belt systems generally exhibit consistently higher uranium values than other depositional facies. Crevasse-channel and crevasse-splay deposits locally contain mineralized carbonized wood. Delta-front sandstones of high-constructive lobate deltas contain uranium. Radioactive minerals are present within conglomeratic parts of the valley-fill sequence. Although a relation exists between uranium occurrence and depositional facies, prediction of uranium occurrence is difficult because of a complex groundwater history.

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Recent Salt Sedimentation in Playa Lakes of Ebro Basin, Spain

In the Ebro River Valley in the northeastern part of the Iberian Peninsula, a playa-lake area covering 65 sq km of Tertiary sedimentary rocks is known as "Los Monegros." Many of the lakes coincide with east-west fault lines, in some of which the scarps are 8 to 10 m high. Year round sampling of 15 of the lakes has been conducted.

In the emerged zone of the playa efflorescences of 5-cm long thenardite crystals occur locally with salts such as halite and blöedite and minor amounts of calcite, dolomite, mica, quartz, and others.

On the highest part of the emerged zone, pulverulent salt crusts are formed of thenardite, gypsum, and halite. The saline crusts as well as the efflorescences are weak and ephemeral, appearing and disappearing quickly, depending on climatic factors such as rain and wind.

The silt which constitutes the habitual sediment of the playa lakes is formed mainly of gypsum with a variable proportion of quartz, micas, calcite, and dolomite. The imbibition waters of the silt precipitate halite and/or blöedite. This silt is commonly on top of a rich layer of organic matter, in which it is not unusual to find halite crystals. In some playa lakes the silt is covered by an algal mat, reddish in hue, with abundant cracks, air bubbles, and tepees.

There are two types of precipitates in the playa lakes: one of halite with thenerdite and blöedite subordinate, and the other of thenardite with blöedite, gypsum, and halite and, in some, traces of glauberite. Salt crystals locally accumulate in bar form several centimeters thick parallel with the coast line.

Hydrochemically, the water in the playa lakes has the following characteristics: (1) the concentration of SO_4 is much greater than that of Ca^{+2}; (2) the concentration of Cl^- is less than that of Na^+; (3) the concentration of anion sulfates, not counting those which theoretically combine with calcium cation, is greater than the concentration of sodium cations not counting those which theoretically combine with chloride anion; (4) the relation: $[(K^+) + (Mg^{+2})/(Na^+)] = 0.30 - 1$.

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Yellow Creek Field, Uinta County, Wyoming

Yellow Creek field extends from Sec. 11, T14N, R12W, 5.5 mi (9 km) northeast to the city of Evanston, Wyoming. The producing structure is a northeast-trending anticline on the hanging wall of the Medicine Butte thrust, an imbricate of the Late Cretaceous Absaroka thrust. Gas and condensate are produced from fractured Middle Jurassic Twin Creek Limestone at depths from 5,750 to 6,736 ft (1,725 to 2,020 m). The pay zones are estimated to have only about 2% porosity, and the thickness of the hydrocarbon column is at least 670 ft (201 m).

The first test, Utah Southern 1 Hatch, was off structure in SW¼ SE¼ NW¼, Sec. 28, T6N, R8E, Summit County, Utah, and abandoned in 1952 in Jurassic-Triassic Nugget Sandstone at a depth of 8,637 ft (2,591 m). No shows were reported. In 1976 Amoco drilled the discovery well, Amoco-Gulf WI Unit 1, in SE¼ SW¼ SW¼, Sec. 2, T14N, R121W, to 8,063 ft (2,419 m) in the Nugget. Initial flowing potential of 120 BOPD and 2.75 MMCFGD was obtained from the Twin Creek. In 1977 Amoco 1 Champlin 375 Amoco A, in SW¼ SE¼, Sec. 17, T15N, R120W, within the city limits of Evanston, became a Twin Creek discovery called Evanston field. Recently this well was completed for 222 BOPD and 1.48 MMCFGD. Subsequent discoveries between Yellow Creek and Evanston by Mountain Fuel, Mesa, and Amoco in 1978 indicate a single field. Currently, Yellow Creek has six successful completions with a combined

IP of 2,254 BOPD and 21.8 MMCFGD. Three wells are testing and only two wells are known dry holes.

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Structural Pattern of Eastern Part of Disturbed Belt of Montana

The eastern part of the disturbed belt of Montana is in the foothills east of the northern Rocky Mountains. The area studied extends about 190 km from Wolf Creek north to Browning, Montana. It is about 30 km wide in the northern and southern parts, narrowing to about 10 km in the central part. The eastern margin is bounded by a thrust fault or folds.

The eastern part of the disturbed belt contains four structural-stratigraphic subdivisions which are, from west to east: (1) thrust-faulted Jurassic and Lower Cretaceous mudstone and sandstone; (2) folded and locally thrust-faulted Upper Cretaceous mudstone; (3) Upper Cretaceous sandstone and mudstone that are imbricately thrust faulted in the northern part, complexly folded near the central part, and folded and thrust faulted in the southern part; and (4) folded and locally thrust-faulted Upper Cretaceous thin sandstone and thick mudstone. The latter is absent in the central parts.

Structural trends change from northwest in the northern part of the area, to due south in the central part, and southeast in the southern part.

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Geology and Structural Control of Geothermal System at Roosevelt Hot Springs KGRA, Beaver County, Utah

The Roosevelt Hot Springs KGRA is located in the Basin and Range province along the western flank of the Mineral Mountains. It is within the Wah Wah–Tusher mineral belt which has been the locus for rhyolitic intrusive and extrusive activity through Tertiary and into Quaternary time. The area is just east of the Sevier (Cretaceous) thrust belt and is near the margin of the Intermountain seismic belt. Geologic mapping has identified three metamorphic and plutonic units of Precambrian age, nine intrusive phases of the Tertiary Mineral Mountains pluton, three Pleistocene rhyolitic extrusive phases, and siliceous hot spring deposits of relatively recent age. Cuttings from exploration holes indicate that the Precambrian and Tertiary crystalline rocks host the present geothermal system.

The structure of the area is dominated by low-angle normal faults (denudation faults) which dip to the west. The hanging wall of the principal denudation fault was intensely brecciated during the fault episode forming steep fault zones which generally strike northwest. Both these low- and high-angle fault zones show the development of intense, silicified mylonites. Adjacent to these mylonite zones, the crystalline rocks are highly fractured. East-west and northeast-trending high-angle faults cut the denudation faults and channel much of the recent hot-spring activity.

The geothermal system is a high-temperature, water-dominated resource which is probably related to an igneous heat source. The low primary permeability of the reservoir rocks and the location of the geothermal field indicate structural control of the system. The reservoir geometries and permeabilities result from the intersections of the principal fault systems.

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Petrology of Tertiary Sandstones of Southern Piceance Creek Basin, Colorado—Implication for Provenance and Depositional Processes

Comparative petrographic analyses of channel-form and tabular sandstone bodies in the upper Wasatch Formation (Paleocene-Eocene) and lower Green River Formation (Eocene) in the southern Piceance Creek basin show that compositional and textural variability is primarily a reflection of provenance and the environment of deposition.

Sandstones from the upper Wasatch Formation and lower Green River Formation are generally similar in texture and composition and have varying concentrations of (1) angular to well-rounded monocrystalline quartz grains, some with abraded overgrowths; (2) fresh and slightly altered potassic and sodic feldspars; and (3) volcanic lithic fragments, mostly andesite. Wasatch sandstones contain slightly more lithic fragments than those of the lower Green River, which are more quartzose. This difference is attributed to the fluvial mode of deposition of the Wasatch in contrast to the marginal-lacustrine nature of the Green River sandstones. Lacustrine sandstone also commonly contains accessory analcime and pyrite.

The sampled intervals of the Green River Formation permit an evaluation of the source terrane and its evolution during development of Lake Uinta. Paleocurrent data suggest that the sources for most of the sediment were on the south, southwest, and southeast. Petrographic similarities among the samples imply a relatively constant source terrane during deposition of the Green River Formation that was composed of Mesozoic and Paleozoic sedimentary rocks and late Mesozoic and early Cenozoic silicic volcanic and plutonic rocks.

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Petroleum Exploration in Younger Over Older Thrust Plates in Southeastern Idaho

West of the Paris and Putnam faults (Bear River and Portneuf Ranges, Idaho), thrust plates of younger strata overlie older with tectonic omissions as great as 7 km, in contrast to eastern foreland thrusts of older over younger strata with repetitions of about 6 km. Folds in the western plates are broad, open, and upright in contrast to tight asymmetric folds in eastern plates.

Three major thrust plates are recognized from extensive but incomplete mapping. (1) An uppermost and