derground mining.

In 1977, coal production from seven strip mines amounted to 23 million tons or 50% of the state's total production that year. The Amax Coal Co. Belle Ayr mine alone accounted for 13.3 million tons. With expansion of the Belle Ayr mine to 17 million tons, the addition of three new mines, and the expansion of other existing mines, production in 1978 probably exceeded 39.2 million tons or about 63% of the state's 1978 production. Forecast annual production from the Powder River basin is 81.1 million tons by 1980 and 123.1 million tons by 1985. Of this tonnage, 95% is derived from the subbituminous Wyodak-Anderson coal bed, which ranges from 20 to 120 ft (6 to 36 m) thick in the east-central part of the basin.

In addition to conventional strip mining activity, two in-situ coal gasification projects are under way in the basin.

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Alluvial Fans and Their Deposits in Devonian Hornelen Basin, Norway

Conglomerate alluvial-fan bodies are well exposed around the fault margins of Hornelen basin. Detailed mapping of the bodies and of their internal facies variation together with logging of laterally equivalent profiles allows reconstruction of fan processes, geometry, internal cyclicity, and relation to contemporaneous flood-basin deposits. Of particular interest is fan-to-fan variation through Hornelen basin's 25 km succession, as illustrated by six examples from the northern and southern margins.

Some fan bodies, particularly with small radius (<2 km), and a rapid change in downfan maximum particle size (>30 cm/km) are entirely dominated by debris flows. The latter are commonly poorly sorted and massive or inversely graded. The ratio of bed thickness to maximum particle size in debris flows is usually less than 3. Other fans, usually thinner bodies, with greater radius (<6 km) and less abrupt downfan grain-size gradients, contain a significant amount of fluvial (braided stream) or sheet-flood deposits, which are usually concentrated in the middle or lower fan reaches.

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Mississippian Carbonate Shelf Margin Along Overthrust Belt from Montana to Nevada

A constructional carbonate platform and a generally north-trending shelf margin in Utah and southwestern Idaho were bordered on the west by a starved basin, flysch trough, and orogenic highland during Kinderhookian to middle Meramecian time. The Antler orogeny produced epeirogenic movements, which resulted in sea-level changes that caused the carbonate platform episodically to prograde and retreat. At different times the shelf was bordered either by a narrow foreslope or by a broad ramp. The sequential history is as follows: (1) Late Devonian thrusting raised the continental margin to produce the Antler orogenic highlands, which in earliest Mississippian time had a low eastern coastal plain that bordered a narrow, shallow marine basin lacking a distinct eastern shelf. (2) Widespread marine inundation of the craton on the east was followed by a stillstand, during which a low shelf margin that turned abruptly eastward in Montana was developed and deposition of clinoform micritic limestone beds occurred in moderately deep water across a very broad ramp. (3) Increased downwarping produced an incipient starved basin, separated by a shallow carbonate bank from the flysch trough on the west and by a broad ramp from the northeast-trending shelf margin on the east; coarse encrinites were deposited alternately with micrites on the ramp. (4) Maximum deepening and expansion of the starved basin were accompanied on the west by deepening of the carbonate bank and on the east by westward progradation of a carbonate platform with a narrow, steep foreslope. (5) Lowering of sea level produced a karst plateau on the former carbonate platform and caused cratonic sands to be carried westward into the basin. Meanwhile, filling of the flysch trough allowed an eastward spillover of distal flysch sediments into the basin. The starved-basin sediments, which have organic-carbon values as high as 7% in outcrop, are considered to be source rocks. Coarse sediments of the carbonate platform, particularly where dolomitized, may serve as petroleum reservoirs.

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Application of Nonmarine Mollusca to Paleoenvironmental Interpretation and Correlation of Paleogene Rocks

Nonmarine mollusks, the most consistently occurring element of Mesozoic and Cenozoic nonmarine macrofaunas, are abundant and locally dominant in many preserved terrestrial and freshwater "paleocommunities." Maximum interpretive potential of mollusk assemblages is derived from detailed analysis of several biologic and physical factors: (1) taxonomy based on modern malacologic and paleontologic concepts that include differentiation of genetic and nongenetic morphologic variability; (2) biostratonomy (the history of the faunal assemblage from death to final burial); (3) community structure; (4) time-space variability of assemblages relative to a detailed lithostratigraphic framework; and (5) rock types, fabric, and structures of the enclosing sedimentary rock. Collectively, these factors indicate whether the faunal assemblage was preserved in the original environment in which it lived. Failure to gather and/or interpret adequately these data has promoted the widely held misconception that mollusks are of little value in the interpretation of depositional environments, biostratigraphy, correlation, and age determination of nonmarine rocks.

Two examples of the interpretive value of Paleocene and Eocene nonmarine mollusks are (1) depositional environments and regional paleoenvironmental reconstruction of part of the Green River and Wasatch Formations, southwestern Wyoming and northwestern Col-