gence events caused tidal flats to be shifted far to the west, and they were unable to prograde out onto the open shelf because of insufficient time before subsidence was renewed, and because the open shelf setting inhibited tidal flat deposition. The Middle Member represents an incipiently drowned sequence that developed by repeated submergence events. Such incipiently drowned shelf sequences are common but poorly documented in the geologic record. They punctuate many aggraded cyclic shelf sequences and may ultimately provide important information for construction of relative sea level curves for the Paleozoic.

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Oil-Bearing Glacial Deposits from Permo-Carboniferous Haushi Group, Oman

A sequence of glacial and related deposits up to 700 m (2,296 ft) thick in the lower part of the Haushi Group contains significant quantities of oil in several fields in south and central Oman and is the main exploration target along the eastern flank of the South Oman salt basin. More than 300 well penetrations demonstrate that the glacial deposits extend over more than 60,000 km^2 (23,166 mi^2) in outcrop and subsurface. The Late Carboniferous to Early Permian Haushi Group (dated through palynology) unconformably overlies Precambrian to Devonian rocks of the Huqf and Haima Groups with, locally, a considerable paleorelief. The glacial deposits are overlain by fluvial and shallow marine deposits of the upper Haushi Group which include a fossiliferous limestone dated as Early Permain (probably Sakmarian).

The glacial origin of units within the lower part of the Haushi Group is established from the outcrop area on the west flank of Huqf massif where striated pavements of Precambrian dolomite have been found. One pavement is directly overlain by a 4 m (13 ft) thick diamictite interpreted as a basal till. In nearby exposures striated boulders have been found.

Both in the outcrops and in the subsurface diamictites with abundant far-traveled material (granite and volcanic boulders) occur. They are considered to be mostly debris-flow deposits of glacially transported material. Their common interbedding with "varved" shales with dropstones is diagnostic of a glaciolacustrine setting. The association of varved shales and diamictites is commonly of sealing quality.

Reservoirs in the glacial sequence are formed by sandstones and clast to matrix-supported sandy conglomerates which are interpreted as deltaic and fluvial deposits. Depositional models and paleogeographic reconstructions have been made with the help of core studies and correlation of facies units using wireline logs. These correlations demonstrate the limited lateral predictability of reservoirs which is not unexpected in view of the geometrical complexity of many modern glacial deposits.

The geometry of facies units is, however, also complicated by syndepositional subsidence, due to both progressive dissolution of Precambrian salt, and to differential erosion at the contact between the glacial sediments and the underlying, unconsolidated sands of the Haima Group.

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Critical Appraisal of Fluvial Facies Models

Interpretation (and subsequent prediction) of the lithofacies geometry of ancient river-channel deposits requires *full* understanding of the formative processes. This is ideally gained by linking channel geometry and hydraulics with sediment erosion, transport, and deposition, using generalized (quantitative) physical models. Such models exist for high-stage deposition in single curved channels of simple planform: they are capable of approximating the three-dimensional variation of mean grain size and internal structure of point-bar deposits in channels with differing geometries and flow characteristics. However, such models cannot presently predict processes operating on point bar tops (e.g., sheet floods, chute channel and bar formation, scroll bars, flow separation zones) or the nature of low-flow deposits. Lateral lithofacies variation due to meander-loop evolution and cutoff is also inadequately understood.

Generalized physical models of braided and anastomosed river deposition are particularly poorly developed, and need urgent attention. Single-channel and braided rivers can be distinguished on the basis of their water discharge, slope, width/depth ratio, and sinuosity; *quantitative* analysis of ancient alluvium is required for reconstruction of these parameters. Although braided river deposits should typically have a high proportion of coarse-grained channel fills relative to lateral accretion deposits, coarse-grained channel fills are also common in sinuous rivers with cutoffs. It appears that presently available qualitative facies models do not adequately represent the range of lithofacies geometries expected from different kinds of rivers, and therefore do not allow thorough and unequivocal interpretation of paleochannel geometry, flow characteristics, and evolution.

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Computer-Assisted Map Evaluation of a Coal Prospect

Posted maps of coal bed thickness, overburden, aquifers, etc were made from reconnaissance drilling of a 15 mi^2 (39 km^2) prospect. These data were then interpreted and hand-contoured to form individual maps of the several geologic factors that influenced the feasibility of in-situ gasification. Contours from each individual map were then digitized, thus allowing expert human interpretation, as reflected in the hand-drawn contours, to be entered into the computer. The computer then formed individual geological maps, structure surface and isopachs, from the sets of contour data. By devising various algebraic combinations of the maps and assigning various favorability weighting factors to the geologic conditions embodied within maps, several alternative interrelations and evaluations of the combined maps could be formed quickly within the computer. These alternate interpretations embraced a range of uncertainties in geological, engineering, and processing conditions.

Several features of this computer method are beneficial to geologic evaluation. The system of computerized combined map interpretation allows both continuous-valued and quantized data to be brought together in one analysis. Human insight and experience are included insofar as original data are input to the computer as complete hand-contoured maps, rather than as isolated points left to a "non-interpreting" gridding algorithm. To produce a computer evaluation of several maps, the geologist is obliged to organize his ideas and think in a quantitative and reproducible fashion about the interrelations of his data sets. Finally, the computer allows the geologist to explore and compare alternative hypotheses in far less time than is required by conventional methods.