(between 7200-9650 ft ss) of Late Miocene, Upper Cycle V clastic deposits, which accumulated in a wave-/storm-dominated, inner neritic to nearshore/ coastal environment within the Palaeo-Baram delta complex.

The sand bodies are characterized by composite (or amplified) coarsening upward/progradational sequences (ca. 160 ft) overlain by generally thinner, fining upward/retrogradational sequences (ca. 20-50 ft thick). The sand bodies are vertically heterogeneous but display high lateral continuity with excellent field-wide well log correlation, which is consistent with the inferred high wave-energy depositional setting.

Vertical heterogeneity is reflected in variations in the thickness and frequency of shale layers, and in the distribution of four distinctive reservoir facies of varying rock quality:

1) *poorly stratified sandstone (porosity ca. 23%, permeability ca. 1200 md).*
2) *bioturbated sandstone (porosity ca. 22%, permeability ca. 500 md).*
3) *laminated sandstone (porosity 19%, permeability ca. 90 md).* *and*
4) *bioturbated heterolithic sandstone (porosity 17%, permeability ca. 50 md).*

The Betty reservoirs are interpreted as representing the repeated build-out and gradual retreat of wave-/storm-dominated sand bodies (shoreface and/or shoreface-connected bars). They probably accumulated in a coastal to inner-shelf environment, which was marginal to the axial part of the Palaeo-Baram delta. Complete coastal progradation never occurred in this area in Upper Cycle V times with the environment remaining sub-littoral. The variations in sequence types reflect fluctuations in sediment supply and repeated base level changes, in which the latter was probably influenced by movements along the nearby Betty growth fault. The preservation of both progradation and retrogradational deposits, and the development of thick amplified sequences are both indicative of the high subsidence rates within the Baram Delta Province.

Hydrocarbons are trapped within at least twenty-one stacked sand bodies separated by sealing shales. The bulk of the hydrocarbons are encountered in a single structural block where trapping is a result of anticlinal dip closure and updip seal against the Betty growth fault. Only minor hydrocarbons are present in subsidiary fault blocks behind the Betty growth fault. Within the Betty structure oil-bearing reservoirs decrease in thickness and frequency with depth, while both associated primary gas caps and unassociated gas reservoirs increase in depth (down to 9500 ft ss). This reflects the thermal maturity profile of oil and gas migration in this area. Late expulsion and migration of gas has led to the preferential displacement of oil by gas in the structurally deep reservoirs.

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Better Accuracy from Sidescan Records: The Object-Chord Method

Malcolm Jones, Racal Survey (Malaysia) Sdn. Bhd., Kuala Lumpur

Sidescan Sonar has become a widely used and often indispensable tool for seafloor engineering and survey activities in the oil industry. This acoustic technique has the ability to create a wide and continuous 'picture' of the 3-dimensional seafloor features and contours, and therefore permits quick and economical acquisition of seafloor information which is not readily available through other types of acoustic instrumentation.

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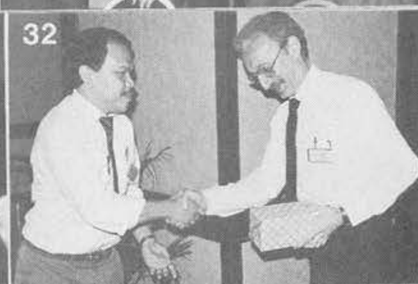
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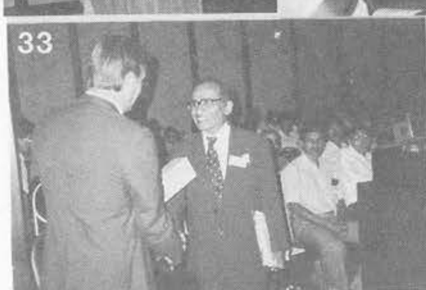
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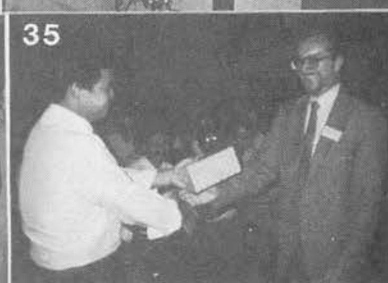
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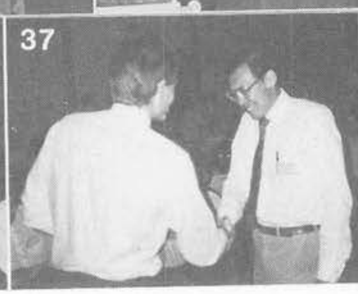
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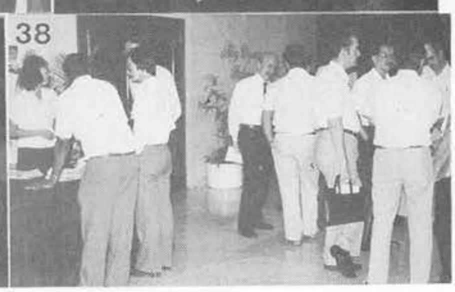
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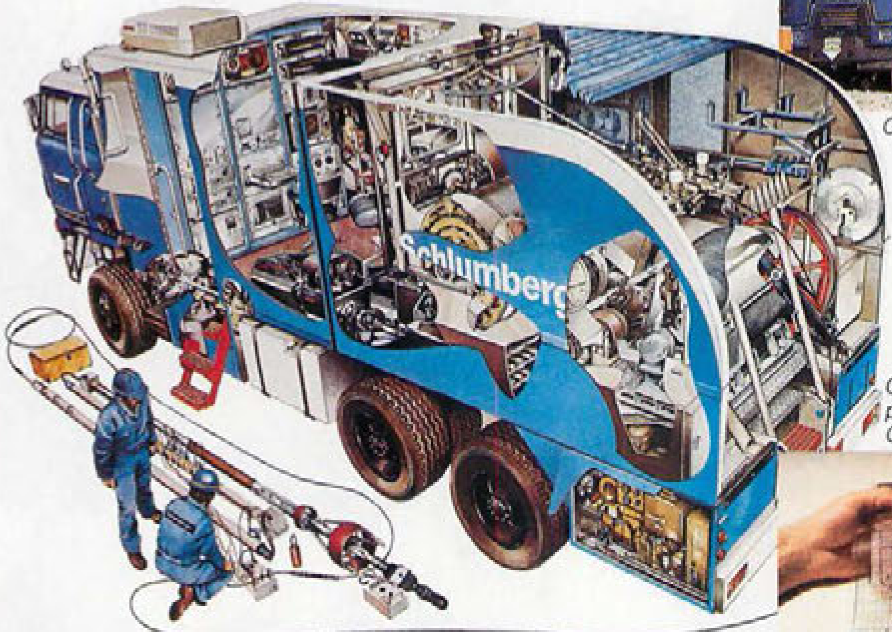
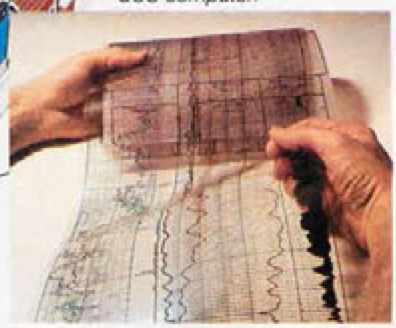
Schlumberger engineer at work with the Cyber Service Unit system inside a wireline logging Unit

Cyber Service Unit on location.



Schlumberger crew checking a logging tool.

Cyberlook, an interpreted log prepared at the wellsite by the CSU computer.



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GSM PETROLEUM GEOLOGY SEMINAR 1986

Captions to photographs

1.	Early registrants at the Registration Desk.
2.	"Nice to see you again". The crowded registration hall.
3.	Registration goes on steadily.
4.	Yang Berhormat Dato' Abdul Ajib bin Ahmad being introduced to members of the welcoming party on arrival.
5.	Yang Berhormat Dato' Abdul Ajib bin Ahmad talking to GSM Council Members.
6.	Organising Chairman, Ahmad Said, announcing the arrival of the guest-of-honour.
7.	Dr. John Kuna Raj, President GSM, with his welcoming address.
8.	Yang Berhormat Dato' Abdul Ajib with his Opening Address.
9 - 13.	The large turnout at the Opening Ceremony.
14 - 16.	A cup of tea/coffee and some discussions before the start of the technical sessions.
17.	Vincent Kong of Sarawak Shell Bhd. on "Multiple Streamers and Source".
18.	Malcolm James of Racal Survey on "The Object-chord Method".
19.	Dr. Johnson of SHELL with a question from the floor.
20.	Ted Selby of GSI on "3D Marine Seismic Exploration".
21, 22.	The orderly rush for lunch.
23.	D.E. Francis presenting the President with ESSO's contribution to the Seminar.
24.	The President receiving SHELL's contribution from R.I. Young.
25.	Noor Azim Ibrahim of PETRONAS Laboratory Services Dept. on a "Modern Beach Ridge System".
26.	Md. Nazri Ramli of PETRONAS Carigali with a comment from the floor.
27.	Frank Fu of CPC on "Cenozoic Basins around Taiwan".
28, 29.	At the poolside cocktail hosted by Schlumberger Overseas S.A.
30.	T. Kuud of SSB on the "Betty Field".
31.	Active participation from the floor.
32.	Ali Somturk of Schlumberger receiving his token of appreciation from Session Chairman, Dr. Nik Ramli.
33.	V.V. Sastri of PETRONAS Laboratory Services Dept. being congratulated by the Session Chairman.
34.	Session Chairman R.I. Young of SHELL discussing a point with Odd R. Huem of STATOIL.
35.	A. Fediaevsky of TOTAL beaming with happiness as he receives his token from Session Chairman, Tony Lim of PETRONAS Carigali.
36.	Terence Quinn being congratulated by D.E. Francis, the Session Chairman.
37.	Lye Yue Hong of ESSO receiving his token from the Session Chairman.
38.	A few final words and 'See you next year'.

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The accuracy of mapped objects interpreted from this method has been limited by the fact that the fist is towed a distance from the vessel and its position is affected by different sea states and current conditions resulting in different feathering angles and layback distances.

Some present interpretation techniques do take into account the uncertain feathering angles of the fish, but they assume no errors in the layback distances. The object-chord method takes into account both the feathering angle and layback errors and in certain circumstances, due to good field practices, eliminates them, resulting in more accurate positions mapped.

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PTV-Modelling as a Predictive Tool in Hydrocarbon Exploration with Examples from the Mid-Norwegian Continental Shelf

Odd R. Heum, STATOIL, Norway

Computerized PTC-modelling has been applied on several examples offshore Mid-Norway to demonstrate how the basic PTV-properties (pressure, temperature and hydrocarbon component distribution) may be critical for the hydrocarbon phase relation in a trap (oil vs. gas or condensates). The productive force of PTV tools in hydrocarbon exploration is tremendous. Hydrocarbon densities, phase relations, gas oil ratios, shrinkage, expansion factor, etc. can be calculated with great certainty with reliable input data. The multiple applications include general basin modelling, flash analysis, dew point analysis and boiling point analysis.

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Controls on the Development of a Modern Beach Ridge System - Significance in Interpretation of Ancient Sequences

Noor Azim Ibrahim, PETRONAS Laboratory Services Dept., Kuala Lumpur.

The interpretation of subsurface stratigraphic and sedimentological information including 40 shallow vibra-cores and 19 bore holes, geomorphological analysis and ground penetrating impulse reflection radar have shown that the stratigraphy of the beach-ridge barrier is composed of two major lithosomes: (1) an earlier trangressive sequence; and (2) and a later regressive sequence with a landward trangressive component. Like other regressive barriers around the world, the regressive phase coincided with the Late Holocene stillstand of sea level. Its development is also controlled by antecedent topography and the presence of large sediment supply.

A SIR-7 impulse reflection radar has documented time line surfaces that have been inferred in previous studies of regressive systems such as along the Gulf Coast of America, in the Netherlands and in Australia. The radar record suggests that progradation of the regressive system occur sporadically. The development of the beach ridge begins during period of abundant sediment influx whereby the beach widens and builds seaward. This accretionary phase is punctuated by a period of low sediment supply when the beach erodes, leaving some cobble and gravels as sediment lag. Subsequence onshore movement of coarse-grained sediment steepens the beach profile forming a ridge. The influx of sediment is controlled by major storms.

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