Shoalwater–Cove Point and the North Beach Peninsula barrier-accretion plain, occurs a 9-km tidal shoal and channel area. A narrow tidal channel, over 20 m deep, with strong tidal currents, has eroded northward over 3 km in this century. Accompanying this erosion, the flood-tide Graveyard-Empire spit is prograding into Willapa Bay, overlapping two older spits at Tokeland and Kindred Island. The deep tidal channel between Willapa Bay and the Pacific Ocean has migrated from south to north at least three times since the initiation of the Grayland beach-accretion plain, correlating the three flood-tidal spits with the three major beach-accretion ridges of the Grayland plain. A secondary, southerly deep tidal channel is forming and may again erode northward, driven by tidal and littoral processes, initiating another beach-accretion ridge on the Grayland plain and another southeasterly trending flood-tidal spit in the near future. The geologic events causing this large late Holocene Epoch coastal plain format, unique to the Pacific coast, remain obscure.

KRUEGER, WM. C., JR., Amoco Production Co., Tulsa, OK

Hydrocarbon Exploration on Ancient Shelf-Slope Breaks

A general set of traps, reservoirs, and seals occurring on the shelf-slope break can be hypothesized based on the structural regime, provenance, and width and slope of the shelf. To evaluate this break is to look at the entire region—shelf and slope.

With a wide or moderately wide shelf, gentle slope, and peneplaned provenance, carbonate sediments would dominate in marine environments. Logically, a reefal environment (reservoir) would be expected at the shelf slope. Conversely, with a narrow shelf and a positive continental borderland in close proximity, terrigenous clastics would be expected. Deltaic-like reservoirs could be expected on the shelf; turbidites would logically occur downslope. A broad shelf with a positive provenance could inspire various lithologic deposition (depending on the environment)—reefal at the shelf-slope area, deltaic or lagoonal behind, and turbidites in front.

Examples of such former reservoirs are Empire-Abo reef trend of Texas-New Mexico; Cretaceous Stuart City shelf margin of Texas; Golden Lane-Pozo Rica trends of Mexico; Miocene pinnacles of the Salawati basin, Irian Jaya; and Kirkuk field on the Arabian Platform.

Penultimate reservoirs are the linear sands of the San Joaquin and Ventura basins; Oligocene sands of south Louisiana; Triassic sands of the North Sea basin; Cretaceous Seaway sands in the Powder River basin; and the ancient Mississippi delta and cone. Latter reservoirs are found in the eastern shelf, Midland basin, and Bombay offshore basin, India.

It is understood that for some of these reservoirs to become traps, the founding structural regime is modified, e.g., faulting, diapirism. Seals are classed as carbonate muds, evaporites, and faults. Source matter may be incorporated in marine shale and limestone deposited in anoxic environments.

KUNZE, FLORENCE R., Shell Oil Co., Houston, TX, and RICHARD E. CASEY, Rice Univ., Houston, TX

Radiolarian Distribution and Enhanced Preservation in Modern Sediments: Indicators of Oceanographic Environments

Analysis of the geographic distribution of radiolarians shows that they are preserved in restricted zones and/or enhanced under particular oceanographic environments. Surface, warm-water-dwelling radiolarians are preserved in the equatorial region. However, intermediate and deep, cold upwelling radiolarians exhibit cosmopolitan distributions in the sediments with enhancement under oceanographic convergences and divergences. Specifically artostrobids and plectopyramids appear to be enhanced in the sediments under oceanographic convergence and divergences; the *Dictyocoryne profunda-truncatum* group is enhanced under high productivity regions; and actinommids in general and collosphaerids in particular are enhanced under the oligotrophic gyre regions. The enhancement under convergences and divergences may be due to (1) mass mortality of deep and/or cold forms brought into warm surface waters via upwelling at a divergence or laterally at a convergence, (2) an increase in standing crop of deep forms under high productivity regions or higher productivity at the convergence's nutricline, or (3) a stripping of the metallic protective coating of shallow forms by bacteria at the nutricline. Collosphaerids may be enhanced in oligotrophic gyres owing to the acquisition of detrital aluminum on their surfaces which might deplete the deeper waters and inhibit deeper water radiolarian preservation. Collosphaerids are also enhanced along the Mid-Atlantic Ridge which may be due to metal abundance in the sediments, low sedimentation rates, and/or high silica concentration of interstitial and bottom waters.

LAGOE, MARTIN B., Stanford Univ., Stanford, CA

Subsurface Facies Analysis of Saltos Shale Member (Miocene), Monterey Shale, Cuyama Valley, California

Distributional analysis of the lithology, sedimentary structures, and microfauna in core samples from oil wells in Cuyama Valley allows recognition of distinctive lithofacies and biofacies in the Saltos Shale Member of the Monterey Shale. Depositional environments are determined from the interpretation of these lithofacies and biofacies. The distribution and character of the depositional environments record the basin-history for this part of the Cuyama basin during the late Saucesian through Luisian (late early to middle Miocene).

Middle bathyal, fine-grained, base-of-slope clastics predominate during the Saucesian. Intercalated, thin-bedded, turbidite sandstones are prominent in some well sections and sand/shale ratios help indicate a source to the north or northeast. Relizian depositional environments are more varied, ranging from middle bathyal shales and siltstones in the area just to the east of South Cuyama oil field, to nonmarine sandstone, conglomerate, and mudstone in eastern Cuyama Valley. The distribution of these depositional environments was controlled partly by contemporaneous tectonic activity as evidenced by depositional thinning over structural highs, abrupt thickening across at least one fault, and progradation of the shelf from the east. By Luisian time the eastern Cuyama Valley area was characterized by shelf-to-nonmarine deposition. This is in marked contrast to upper bathyal diatomaceous mudstones and diatomites which accumulated in a low-oxygen environment immediately to the west, in the vicinity of Whiterock Bluff.

The Monterey Shale is overlain by the shallow-water Santa Margarita Formation (late Miocene), which marks the final phase of marine sedimentation in the Cuyama basin.

LAMBIASE, JOSEPH J., and J. K. COSTAIN, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA