upper members, respectively, of the Gros Ventre Formation) contain evidence of shoaling carbonate-clastic associations within a major transgressive sequence.

Death Canyon carbonates accumulated far offshore in relatively shallow water of restricted circulation. The basal portions of the Death Canyon represent subtidal blanket carbonates consisting of burrowed and mottled biomicrites and peloidal biomicrites. Strandline stability resulted in prolonged periods of vertical aggradation of this carbonate platform into progressively shallower water. Evidence for this shoaling includes: (1) increase in abundance of ooids and intraclasts up section; (2) increase in the relative abundance of siliciclastic debris up section; (3) coarsening upward of the siliciclastics; (4) occurrence of cryptalgal structures and large algal stromatolites as well as desiccation features near the top of the Death Canyon. These stromatolites are closely spaced circular mounds from 1 to 3 m (3 to 9 ft) in basal diameter and 0.5 to 2 m (1.6 to 6.6 ft) in height. The mounds consist of a thick inner faintly laminated zone and a thinner outer zone of discrete columns composed of curved laminations. Pits and channels occur on the outer surface and probably represent areas where low-water stage runoff was concentrated.

Carbonate production diminished with the influx of fine-grained siliciclastics near the Death Canyon–Park contact. Although the lower Park is predominantly dark, micaceous shale, it also contains cryptalgal micrites, algal stromatolites, and lenticular beds of feldspathic and arkosic arenites. These deposits all accumulated in shallow water a considerable distance from the Middle Cambrian shoreline. The siliciclastics were derived from nearby source areas that were probably offshore islands of Precambrian crystalline basement. Facies associations indicate deposition of the coarser clastics in subtidal settings.

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Barreirinhas Basin, an Equatorial Atlantic Transform Basin

A regional study of the Barreirinhas Basin, located in the Brazilian equatorial Atlantic margin, revealed that this basin does not fit the classical rifted Atlantic margin model and that it should be interpreted as a transform basin.

Three major stratigraphic sequences, Canarias, Caju, and Humberto de Campos, limited by unconformities, represent the principal evolutionary steps of the basin. The basin evolved from an initial rift phase dominated by tension (early or pre-Aptian?) to a transform phase dominated by lateral motion with tension/compression produced by a wrench system (late Aptian). These events were followed by a more quiet period as final separation (Albian-Cenomanian) and subsequent continental drifting (Upper Cretaceous to Holocene) occurred.

The Aptian sediments (Canarias) were formed by clastics representing fluvial-deltaic and fan delta, slope, and basinal depositional systems. The Albian-Cenomanian sediments (Caju) comprise cyclical deposits of carbonates and shales representing carbonate shelf and slope depositional systems. The Upper Cretaceous to Holocene sediments (Humberto de Campos) are composed of mixed coarse clastics, carbonates, and shales representing fan delta, carbonate platform, and slope-basinal depositional systems.

Structural and isopach maps, based on seismic and well data, allowed the determination of the structural framework and displayed several features not related to a normal rift basin. The structural grain of the basin at the end of the Aptian is formed by a succession of folds arranged in a consistent north-northeast en echelon pattern displaced by normal and strike-slip faults. Also, inversion structures affecting deep sedimentary sections and local shale mobilization associated to fault zones are present in the central and eastern area of the basin. All these features indicate that the area was affected by a right-lateral motion in connection with the separation of African and South American plates. The motion was directly related to the Romanche fracture zone, as shown by the reconstruction of continents at the end of the Aptian.

From east to west, the complexity and magnitude of the wrench tectonics gradually decrease, and in the westernmost area (Plataforma de Ilha de Santana) only horst-and-graben rift tectonics is observed. The stratigraphy, controlled by tectonics, also changes from a thick Aptian section in the east to a thick Upper Cretaceous to Holocene section in the west.

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Depositional Patterns in Point Lookout Sandstone, Northwest San Juan Basin, New Mexico

The Point Lookout Formation, which is well exposed along the northwest margin of the San Juan basin in northwestern New Mexico, includes nearshore sediments deposited during a regression of the Late Cretaceous epicontinental sea in earliest Montanan time. The unit is composed of sandstone and siltstone with sand percentage increasing up-section. Principal outcrop lithofacies include a lower interbedded, highly bioturbated, very fine sandstone and shale that represents the transition from inner-shelf to shoreface environments. The middle part of the unit gradationally overlies the lowermost lithofacies and represents a complex depositional history in the nearshore zone. These progradational units are thickly bedded and coarsen upward. This simple sequence is interrupted by the occurrence of hummocky stratified storm deposits and by broad surfaces of nondepositional scouring in the lower shoreface. A medium-grained upward-fining sandstone lithofacies that caps the entire formation has an erosional base and large-scale lateral accretionary bedsets.

Measured sections from the outcrop of the Point Lookout closely correspond with electric-log patterns from subsurface data east of the outcrop belt. The mapped distribution of SP-pattern facies (representing sandstone textural characteristics) depicts the primary depositional elements of the progradations. Correlation of genetically related sand packages permits the evaluation of changing sedimentation patterns through time. Seven regressive events (time-stratigraphic units) are recognized based on subsurface identification of the transgressive boundaries that rise stratigraphically away from the basin and obliquely traverse lithofacies boundaries. Each unit is composed of three depositional phases (progradation, transgression, and aggradation) that occur in regular succession.

Discrete distributary and interdistributary areas were maintained in the initial depositional phases throughout the history of the Point Lookout. In the broad areas between depositional axes the shoreline prograded by the seaward accretion of beach ridges until sediment sources became insufficient to maintain the shoreface advance. Transgressive reworking of the seaward part of the unit followed and dominated the arrangement of net-sandstone thicks by redistributing the sands into a strike-alignment. Each time-stratigraphic sedimentary unit is therefore the product of a progradational-transgressive depositional couplet. Whereas periodic transgressions were mainly erosive, they did cause the formation of coalesced shallow-shelf bars analogous to estuarine-shoal retreat massifs found on the modern continental margin of the Mid-Atlantic Bight.

During periods of shoreline stability following transgression a