below the base of the Rome Formation. Fractured zones associated with ramp and splay faults and probable truncated stratigraphic and structural traps may be favorable for the accumulation of hydrocarbons beneath the decollement.

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Transition from Clastic to Peat Sedimentation in Appalachian Basin Pennsylvanian Swamps in West Virginia and Pennsylvania

Paleobotanic, sedimentologic, and lithologic analyses of 34 core samples of underclay from the New River and Kanawha Formations of the proposed Pennsylvanian System stratotype, West Virginia, and 14 samples from strip mines in the Llewellyn Formation from the anthracite fields, Pennsylvania, indicate that more than half of the coal beds studied began forming in response to changing sedimentation and edaphic conditions that were facies independent. Peak formation was a consequence of factors that favored increased organic accumulation in swamps previously dominated by clastic deposition (clastic swamps). The underclay beds grade upward from gray mudstone that is intensely rooted, but otherwise free of plant fossils, to fissile, vitrain-rich, rooted, black shale containing abundant plant fossils, to coal. The black shale flora consists of lycopod, pteridosperm, and calamite branches and large trunks. Foliage is absent because it was destroyed by rooting and decay. The trunks are lying in situ. They are unidirectionally oriented in places, and usually associated with *Stigmaria* rooted hummocks. Trunk accumulations are never associated with flood-transported or lacustrine sediments. Trunks were preserved when a rising water table led to a reduced oxidation potential in the underlying mud. The change from clastic sedimentation to peat formation was rapid in most swamps, as evidenced by a transition zone only a few millimeters thick. However, evidence of longer transition stages is present for some swamps where as much as 0.5 m of black shale was deposited. Occasionally, several cycles of underclay-black shale formation were repeated before peat accumulation began. The transitional process could have been arrested at any time before ideal peat-forming conditions were attained. The gradual transitions from clastic to organic sedimentation suggest that swamp types form a continuum between clastic and peat swamp end members.

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Thick-Skinned, Thin-Skinned, and Balanced Sections of Southern Appalachians

The conflict between thick-skinned and thin-skinned thrust belt hypotheses in the southern Appalachians has been conclusively decided in favor of the thin-skinned interpretation by seismic surveys and drilling results. Balanced cross sections are a logical development stemming from the thin-skinned thrusting hypothesis. Three detailed balanced sections across the region (northern Alabama, Knoxville area, and Blacksburg area) are compared with the early thin-skinned and thick-skinned models of Rodgers, Cooper, and Chamberlin. In Virginia, Cooper's hypothesis about the order of thrusting and synchronous evolution of structures associated with basement fault motion have been disproved by modern mapping, fabric, and paleontologic work. In northeast Tennessee, the no-basement hypothesis has been relatively well established since the work of Rich. In the Alabama-Georgia segment, discussion continues about the origin of some major structures. Balanced section concepts require that the sections be restored to their pre-deformational configurations.

In retrospect, the geologic reasoning based on surface stratigraphic thicknesses and structural styles should have convinced us of the thin-skinned nature of thrusts without the seismic data that seemed essential at the time. The COCORP seismic results should have been no surprise had the geologic reasoning of balanced sections been believed.

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Newark Rift System: A Potentially Prolific Hydrocarbon Province

Many oil tests in the Newark rift system have been encouraging. The data from these tests combined with data collected previously indicate that the geologic and geochemical criteria required to produce significant quantities of hydrocarbons have been met in several of the basins.

Most of the wells drilled heretofore were not positioned using specific geologic or geophysical data. In fact, the industry only recently recognized the play as viable and has applied geophysical techniques to the search for potential hydrocarbon-bearing structural or stratigraphic traps. This activity has partially revealed the geologic processes involved in the development of the basins. The Sanford basin of North Carolina, for example, is a simple half graben, whereas the Richmond basin of Virginia seems to be more complex structurally and may have been affected more by wrench tectonics, producing structures similar to those found in the lake basins of the East Africa rift system.

Each basin's hydrocarbon migration history, however, cannot be fully documented at this embryonic stage of exploration. It is, therefore, necessary to continue to build the geophysical, geological, and geochemical data bases until a well-substantiated model of the migration history can be established. The migration history together with the tectonic evolution of the basin enhances the chances of finding where hydrocarbons are presently trapped. Currently, prospects are being evaluated in several basins. There is a reasonable chance that reserves will be found. At the very least, the wells will aid the exploration effort and refine the exploration theories.