Proceedings of the Iowa Academy of Science

Volume 35 | Annual Issue Article 40

1928

Uncomfortable Relations of Bethany Limestones

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UNCONFORMABLE RELATIONS OF BETHANY LIMESTONES

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In the general section of the coal measures of Iowa, Missouri and Kansas there are two unconformities which are really quite notable in our stratigraphy. One of these, the one at the base of coal measures, receives wide consideration from earliest days, albeit its sedimental equivalency and time-expression is little regarded. That there is another unconformity within the Carbonic section, hardly less notable than the first one mentioned, at the base of the Bethany limestones bevelling all the productive coal section is a very much more recent realization.

As presented before this Academy many years ago,[1] in a paper entitled the "Depositional Equivalent of the Hiatus at the Base of Our Coal Measures," effort is made to give some idea of the sedimental magnitude of the interval represented by a simple, inconspicuous unconformity-plane which we meet with at many points throughout the southeastern half of the State, and to infer the length of the time-span of that sedimental break. The stratal column which is found to fit exactly into this gap in Iowa proves to be in Arkansas nearly four miles in thickness. Of course, as we now know, all of this prodigious bulk of land waste does not come off the country lying immediately to the north of the present Ozark uplift which is a relatively recent feature. Much of it certainly is transported from the northwest and west, as far west as the southern Rocky Mountains where regional depletion sweeps off not only all of the stratal successions but the ancient crystallines as well far down into the pre-Cambric complex.

Thus, in Mid Carbonic times the broad expanse stretching away from Illinois to New Mexico and from the Ozarks to Canada, perhaps, is undergoing regional planation and base-leveling. Before this process is completed Iowa-land begins to be depressed to below sea-level, and our lower, or productive, coal measures are laid down upon the southern portions of this old peneplane.

Then comes another depressive movement, this time from a different direction, originating in the far Southwest. The Pacific Ocean begins an invasion of the continental interior reaching eventually into Iowa-land and on so far eastward as the Great Lakes and Indiana. The great Aubreyan limestone of Arizona, which marks this invasion of the western oceanic waters, rests directly upon the eroded surface of the crystalline basement now the summits of the Rocky Mountains, and covers unconformably the Early Carbonic

1 Proc. Iowa Acad. Sci., Vol. VII, pp. 119-123, 1901.

strata, the Devonic, and earlier rocks, while by this time Pacific waves roll over our State. This marine deposit reclines upon our Des Moines series of coal measures at ever higher and higher horizons.

This record of the great marine transgression into Iowa finds expression in our Bethany limestone, which proves to be only one out of many successive eastward extensions of the Pacific-born Aubreyan limestone, overlapping, and interdigitating with littoral clays, and betokening vigorous oscillatory movements of the old sea-bottom.

Diagrammatically represented the terranal relationships of the several provencial series are about as indicated in the annexed cut (figure 1).

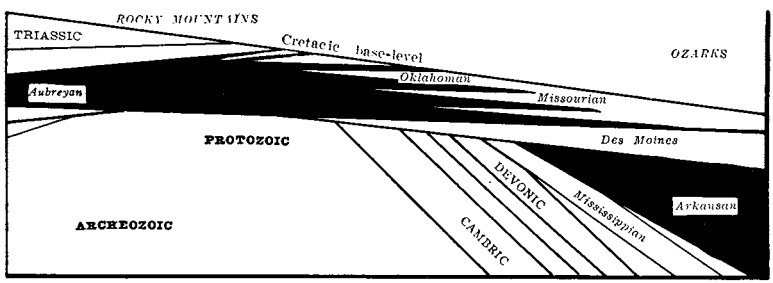

Fig. 1. Stratigraphy of Carbonic Rocks in Continental Interior

Thus, the stratigraphic relationships of our lower coal measures and upper coal measures, instead of being those of contemporaneous deposition of littoral and pelagic formations along the same horizon, as might be inferred from the descriptions in the early reports [2] of our Iowa Geological Survey, are rather these of distinct overlap and unconformity, a feature which none of the critics of the early notion bring out.

EASTWARD EXTENSION OF ANCESTRAL ROCKY MOUNTAINS GEOSYNCLINE INTO IOWA

CHARLES KEYES

Despite the circumstance that in the Iowa part of the Great Plains, lying between the Mississippi River and the Rocky Mountains, the deep well-drillings usually sink only to that famed aquifer, or artesian reservoir, the Peter sandstone, the ancient crystalline basement beneath all of the tall column of sedimentaries is entered in a number of instances. Touching the deeply buried

2 Iowa Geol. Surv., Vol. I, p. 118, 1893; also, *Ibid.*, Vol. II, p. 161, 1894.