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Chronologic Setting of Des Moines Coal Measures

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creased waters from the glacier were turned down the old Minnesota River valley, becoming the River Warren.

During deglaciation of the Keewatin ice-cap, the master drainage effects took on four different and independent phases. River Warren continued to drain the ice-field for 150 years, until the ice-front melted back to Big Stone lake, at the divide between Gulf of Mexico drainage and that of Hudson bay. Then it became the outlet for the ever growing Lake Agassiz, which became continually larger and deeper as the ice retreated down the old Red River valley, where, of course, the front of the glacier served as a dam against northern outlet.

In some respects Glacial Lake Agassiz is unique in its genesis amongst the lakes of the world. Potential lake-basins commonly began to give rise to bodies of water by filling first at the lowest place, and continue to enlarge until overflow at the lowest point in the basin's rim. In strong contrast, Lake Agassiz began to form at its highest level, at the point of overflow, and gradually grew in depth as the ice removed itself from the deeper and deeper parts of the pre-Glacial, north-sloping basin, until, finally, when the ice-front had melted back from the basin's lowest part and permitted access to Hudson bay, the lake was suddenly drained.

Thus the upper Des Moines River took part in one of the strangest changes of drainage that the world has ever experienced.

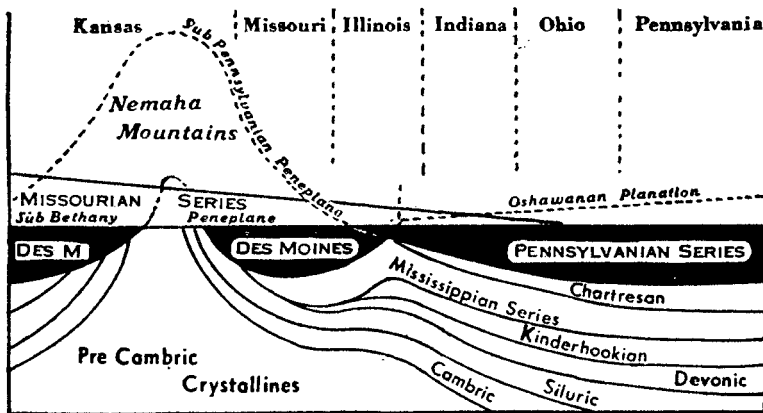
DES MOINES, IOWA.

CHRONOLOGIC SETTING OF DES MOINES COAL MEASURES

CHARLES KEYES

In its broader, or continental, relationships, the chronologic position of our Iowa Productive coal measures assumes an altogether different aspect from that heretofore commonly presented, and that is implied by their incorporation under the title of Pennsylvanian series. Recent physiographic and diastrophic analysis separates completely our Des Moines coal measures, of the continental interior region, from the typical Pennsylvanian coal section of the Atlantic border.

Instead of the western and the eastern coal measures being deposited at the same time, and being parts of the same terrane, the Des Moines series was largely formed from the ruins of Appa-



American Carboniferous Serial Stratigraphy.

lachian rocks; while the Pennsylvanian series were erected out of the ruins of the one-time enormous thickness of Des Moines coal measures, raised into the lofty Nemaha Mountain range of eastern Kansas, Nebraska, and Oklahoma.

The stratal kinships are indicated by the annexed diagram. As shown, the Pennsylvanian coal measures occupy the erosional interval between the Des Moines series and the Mississippian series of Iowa and the Mississippi Basin region.

DES MOINES, IOWA.

POSSIBLE REPRESENTATION OF GUADALUPAN SERIES OF IOWA

CHARLES KEYES

Of all of Iowa's geological formations the Dodge gypsum has held out longest and most resolutely against divulging its age. As is well known, it has been often regarded as Permian, ever since argued by Hall,¹ in the middle of the last century; but there were no really direct evidences supporting his notion, and there were no fossils verifying such assumption. Nothing but analogy to other gypsum deposits could ever be adduced. Even Wilder's arguments² were nothing more than happy analogies; and his conclusions on age and origin could just as well apply to the gypsums of eastern Europe, as to those of Kansas.

Recently, new clue to the possible genesis of Iowa's gypsum beds was revealed in the far Southwest, a thousand miles away. This

¹ Geology of Iowa, Vol. I, p. 142, 1858.

² Iowa Geol. Surv., Vol. XII, p. 115, 1902.