

Proceedings of the Iowa Academy of Science

Volume 19 | Annual Issue

Article 28

1912

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Recommended Citation

Van Tuyl, Francis M. (1912) "The Salem Limestone and Its Stratigraphic Relation in Southeastern Iowa," *Proceedings of the Iowa Academy of Science*, 19(1), 167-168.

Available at: <https://scholarworks.uni.edu/pias/vol19/iss1/28>

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THE SALEM LIMESTONE AND ITS STRATIGRAPHIC RELATIONS IN
SOUTHEASTERN IOWA.

BY FRANCIS M. VAN TUYL.

While making a study of the Keokuk beds in southeastern Iowa during the field season of 1911, the writer was attracted by certain irregularities at the contact of those beds with the overlying strata. The Keokuk, instead of being followed always by the Warsaw, which is the normal order, was found to be succeeded above sometimes by a dense, white, fine-grained, non-fossiliferous limestone, and sometimes by a fossiliferous magnesian limestone or by an arenaceous phase into which it grades laterally.

The correct interpretation of this stratigraphic relation was reached only after many sections had been studied. It was found that the fossiliferous magnesian limestone and its equivalent arenaceous phase is a distinct formation, and that the fine-grained, dense, non-fossiliferous limestone is the St. Louis. The fossiliferous magnesian formation or its equivalent has been, in places, completely eroded, permitting the St. Louis limestone to lie unconformably upon the Warsaw or Keokuk. A section in Henry county shows clearly that the fossiliferous magnesian limestone of this horizon is unconformable both with the St. Louis above and with the Keokuk below.

It was thought at this time that the formation might be of the horizon of the Salem limestone of Illinois and Indiana, but as it was not then known by me that Weller⁴ ⁵ had traced this terrane as far north as Hancock county, Illinois, considerable hesitation was entertained in drawing final conclusions. The fossils of the limestone were so poorly preserved that little use could be made of them in clearing up the difficulty. Subsequent perusal of the literature on the Salem and a trip to Warsaw to study the formation as described there by Weller has, however, led the writer to accept positively the conclusions which he had previously doubtfully entertained. Professor G. F. Kay, State Geologist, who visited the region recently, corroborates this interpretation.

By earlier writers this formation has been variously classified and interpreted. Hall included it with the Warsaw, but by Gordon¹, Keyes², and Savage³ it has been regarded as the basal member of the St. Louis. According to these writers the St. Louis limestone of the region embraces three units, namely, (1) a brown magnesian limestone characterized by the coral *Lithostrocion canadense* and sometimes grading into arenaceous layers, at the base; (2) variable beds consisting of dense gray limestone often brecciated and sometimes containing a bed of sandstone; and (3) a compact, thinly bedded, gray, fossiliferous limestone. By Bain⁶ ⁷ these divisions have been designated the Springvale, the Verdi, and the Pella, respectively. The subdivision here designated the Springvale has been made formerly to include the limestone which is now known to be of Salem age. The prevalent conception of many writers that the basal portion of the St. Louis limestone, which sometimes bears

the coral *Lithostrotion canadense*, is continuous with the arenaceous or dolomitic beds now known to be of Salem age is incorrect. It is true that the arenaceous layers do often pass laterally into limestone, as has been stated, but this limestone is stratigraphically lower than the magnesian phase which sometimes occurs at the base of the true St. Louis and it is distinctly different both physically and faunally from that stratum.

The common misconception as to the identity of the two formations has resulted, no doubt, from the stratigraphic position of sometimes the one and sometimes the other just above the Keokuk or Warsaw. Apparently the unconformity which exists at the top of the Salem was not suspected by former workers in the field.

In its typical development the Salem may be studied at Warsaw and Niota, Illinois, and at Augusta, and Lowell, Iowa. But many other localities which illustrate the stratigraphic relations of the formation could be cited.

On account of the emergences which directly preceded and followed the deposition of the Salem in the region, this formation appears at no definite horizon and possesses a very inconstant thickness. Thus, instead of succeeding the Warsaw beds as in the normal sequence, the formation in various stages of development may rest upon an eroded surface of the Upper Keokuk (Geode bed), or may be completely wanting when the St. Louis rests upon beds sometimes as low as the Lower Keokuk (Keokuk limestone.)

The fauna of the formation is noted principally for its fenestelloid bryozoans among which there are many genera and species. These, with a few brachiopods, the most important of which is a *Productus* closely resembling *P. burlingtonensis*, are the most prevalent fossils.

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