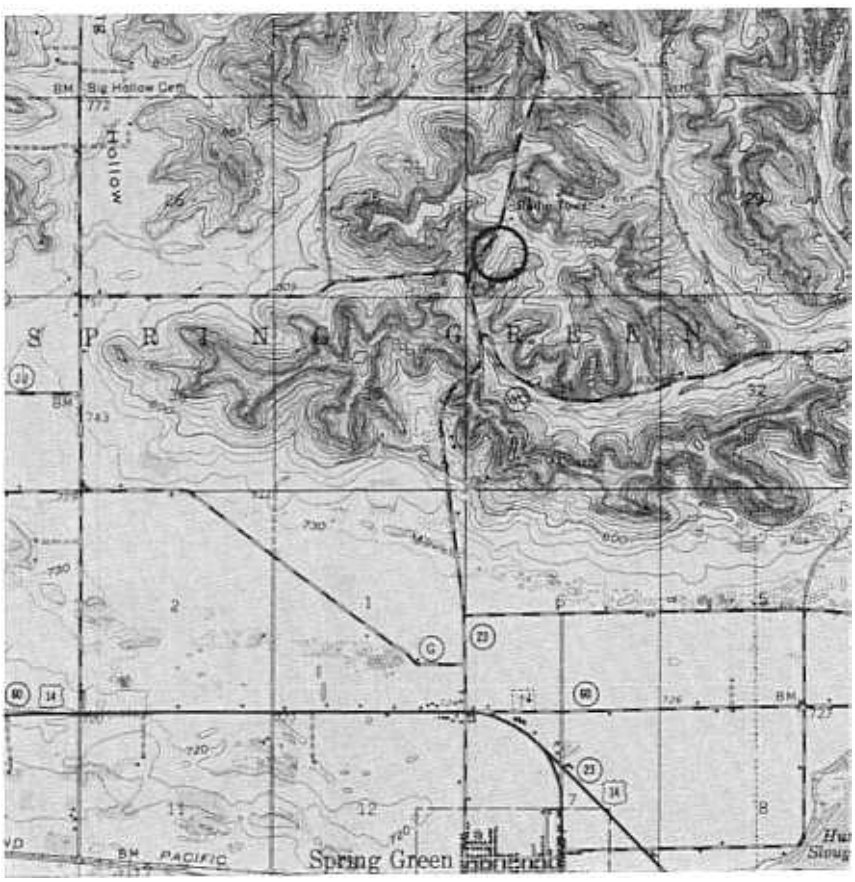
Outcrop 8

Title: Spring Green

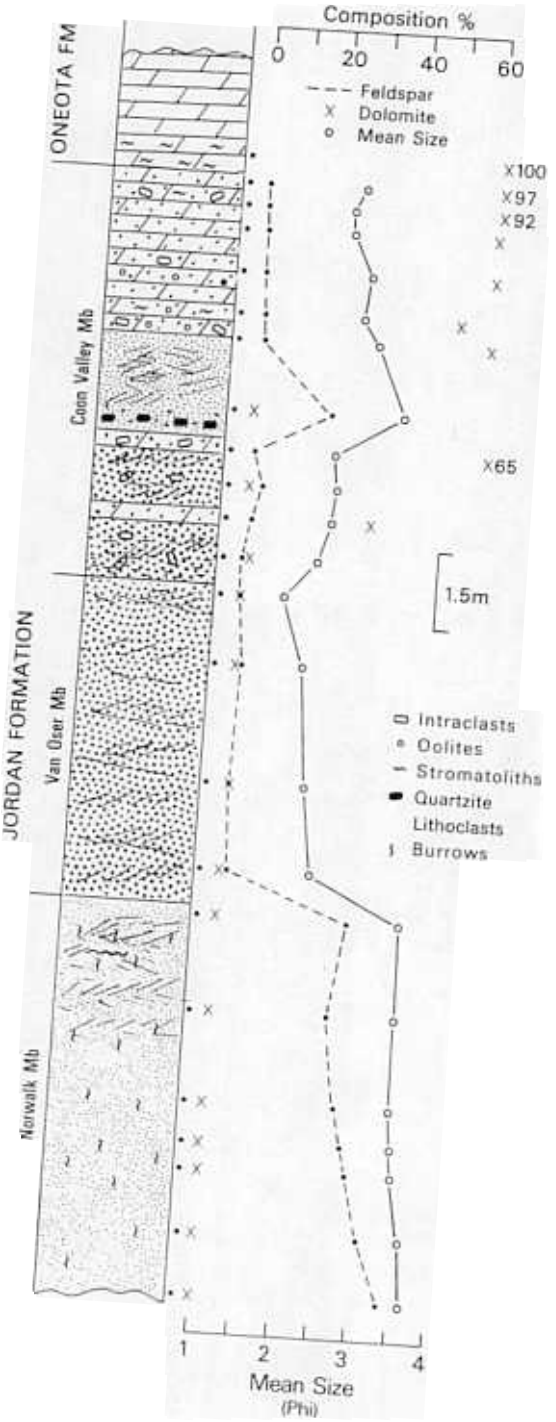
Location: East Side of Wisconsin Highway 23, 4 miles north of Spring Green, Wisconsin in the NW¼, SW¼, SW¼, Sec. 30,T. 9N., R. 4E., Sauk County. (Spring Green 15-minute topographic quadrangle, 1960).

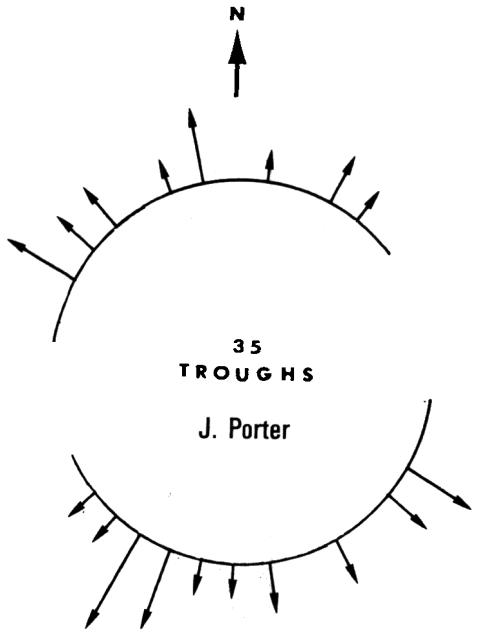


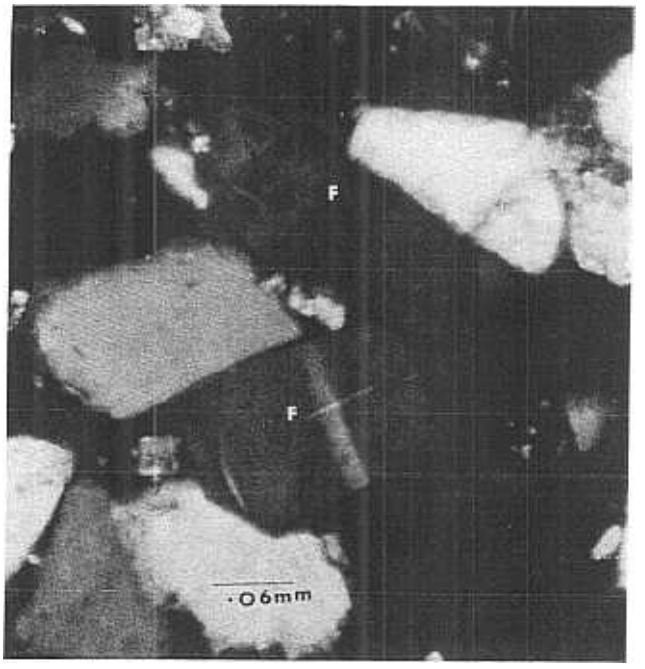
Author: I. E. Odom

Description: This exposure is significant because it illustrates the approximate lithic nature of the Jordan Formation in western Wisconsin, eastern Minnesota, and northeastern Iowa. It also shows the frequent transitional nature of the Jordan and St. LawrenceFormations. Typical of its character elsewhere, here the Norwalk Member is a very feldspathic, very fine-grained sandstone. At this location the Norwalk Member ranges from massive to thinly bedded, and cross stratification is present in the upper 3 to 4 meters, although in other areas it is often entirely massive. Some beds are highly burrowed, which also is a typical characteristic. The plunge of trough axes in the top of the Norwalk Member, determined by Jane Porter (1978) shows two modes approximately 180° apart. No distinct contact between the Norwalk Member and the St. Lawrence Formation is identifiable in the exposure.

SPRING GREEN, WIS.







(Left) Plunge directions of trough axes in the upper portion of the Norwalk Member.

(Right) Detrital feldspar (F) with authigenic overgrowths in the Norwalk Member.

The feldspathic Norwalk Member is in sharp contact with the overlying fine-grained quartzose Van Oser Sandstone, and the Van Oser Sandstone coarsens upward. In many areas a coarsening-upward texture is characteristic of both the Norwalk and Van Oser Members, and the two members are often transitional through an interval of approximately one meter.

The Coon Valley Member,which is 9 meters in thickness, contains approximately 2/3 dolomitic sandstones and 1/3 sandy dolostones, and the upper sandy dolostones are in sharp contact with the overlying nonsandy Oneota Dolostone containing stromatoliths. Note that a thin, sandy dolostone bed containing stromatoliths also occurs near the top of the Coon Valley Member. Stromatoliths are almost always present in the basal beds of the Oneota Dolostone, and it has previously been suggested that stromatoliths might be used to mark the base of the Oneota. Thin, sandy beds containing algal structures are very common in the Coon Valley Member elsewhere in western Wisconsin, thus it would be tenuous to use algal beds for marking the contact between the Jordan and Oneota Formations. On the contrary, if sandy content is used the contact can be easily picked with the aid of a hammer and hand lens.

Note that a prominent zone of Baraboo Quartzite lithoclasts (granules and pebbles) occurs about 3.5 meter above the base of the Coon Valley Member. These attest to the fact that some part of the Baraboo Islands or associated conglomerates were still being eroded during the deposition of this member.

The lower 4.5 meters of dolomitic sandstones in the Coon Valley Member were previously called the Sunset Point Formation or Member. Based on your evaluation of the texture, mineralogy and sedimentary structures, would you consider these

dolomitic sandstones to be the lithic equivalent of the type Sunset Point Sandstone at Madison? Although the Coon Valley Member is divisible into two fairly distinct lithic types at this outcrop, this differentiation is quite often not this straight foward, and it is for this reason that the dolomitic sandstones and sandy dolostones which intervene between the Van Oser Sandstone and the non-sandy Oneota Dolomite are combined into a single lithostratigraphic unit. In this context, the Coon Valley Member averages 10.5 meters in thickness and is traceable in outcrop throughout western Wisconsin, eastern Minnesota and northeastern Iowa and also into the subsurface to the south. Note that it is primarily the interval of dolomitic sandstones composing the lower 2/3 of the Coon Valley Member at this outcrop which are not well represented over the Wisconsin Arch.

Interpretations - Odom and Ostrom (this guidebook) and Odom,Wegrzyn and Ostrom (in press) interpret the very fine-grained, feldspathic Norwalk Member to have been deposited in the broad lagoon situated between an off-shore shoal and bar complex to the southwest (Iowa) and a near shore littoral zone to the north (Fig. 21). The current directional data for the Norwalk at this outcrop suggest that tidal processes possibly produced the cross stratification in the upper part. If the bimodal plunge of trough axes is related to the ebb and flood of tides, it would support the model suggested by Odom and Ostrom (this guidebook), which supposes that a significant tidal range was involved in the deposition of the overlying Van Oser Member. The variation of sea level caused by a significant tidal range is also believed to in part account for the widespread distribution of the Van Oser Sandstone.

A sedimentological mechanism is also necessary to explain the distinct stratigraphic differentiation of feldspar in very fine Cambrian sandstones such as the Norwalk. A tenable mechanism for the enrichment of feldspar in very fine sands and its removal from fine and medium sands is that feldspar was selectively reduced in grain size by abrasion in extensive high energy littoral environments, such as the Van Oser Sandstone, then sorted and transported to off-shore and lagoon (Norwalk) environments by currents that were at least partly related to the ebb and flood of tides over the littoral environments.

The sharp contact between the Norwalk and Van Oser Members suggests that they may be disconformable, since these members often are transitional. A minor unconformity is recognizable at this stratigraphic position farther west

The Coon Valley Member appears to represent several types of comparatively high energy environments ranging from littoral to carbonate shelf. Tidal currents may also have been operative during deposition of some lithic types. Mud cracks are sometimes found which strongly suggest local subaerial exposure, thus local intertidal conditions.

Melby (1967) reported Ordovician age conodonts from shaly beds now considered part of the Coon Valley Member. Where then is the Cambro-Ordovician systemic boundary? The best position if based on physical criteria would be at the base of the Van Oser Member.