

# Correlating the Fulton Site within the Gettysburg Basin

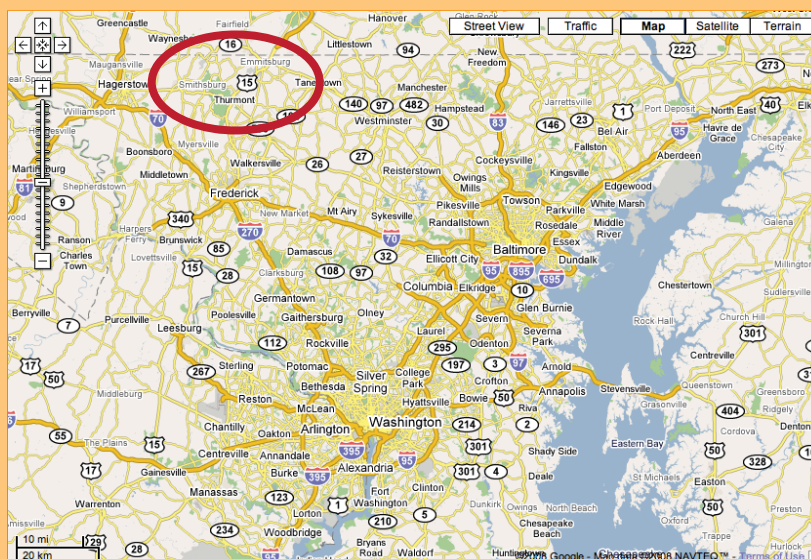
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Geology 394 H

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## Abstract

The Fulton Site, a recently discovered fossil locality, lies within the Gettysburg Basin in the Newark Supergroup. Though this site has produced several vertebrate and invertebrate trace and body fossils, it has not been correlated stratigraphically. There are currently two leading hypotheses on the lithostratigraphic position of the Fulton Site. The first is that the site is the New Oxford Formation (a fluvial unit), and the second is that it is the Gettysburg Formation (a lacustrine unit). Another issue is of age, which has been confused with lithostratigraphy in the past. The hypotheses that are independently tested in this study are that the site lies in the New Oxford Formation and that it is Carnian in age. In order to test these points, the rocks are characterized and depicted in a measured section. The site comprises red siltstones and black shales, representing a lacustrine environment. The fossil material was dated to constrain an age for the site. Some fossils (i.e. plants from a nearby site) were narrower in age range and therefore more useful in dating the site than other body or trace fossils. Using all the available information the most specific age that the site can be placed at is the interval encompassing the Carnian and Norian. Regional maps were examined to further explore the locations of the New Oxford and Gettysburg Formations in nearby quadrangles. Strike and dip measurements were used indirectly to find the boundary between the formations. The extrapolation of the boundary was verified by the observation of outcrops. This information shows that the Fulton Site lies unambiguously west of the boundary.



**Figure 1:** Road map of Maryland with Fulton Site circled in red.

## Hypotheses

Two hypotheses:

- 1) The site is in the New Oxford Formation
- 2) The site is Carnian in age.

These were tested independently in this study by examining the rocks and the fossils at the Fulton Site and neighboring outcrops.

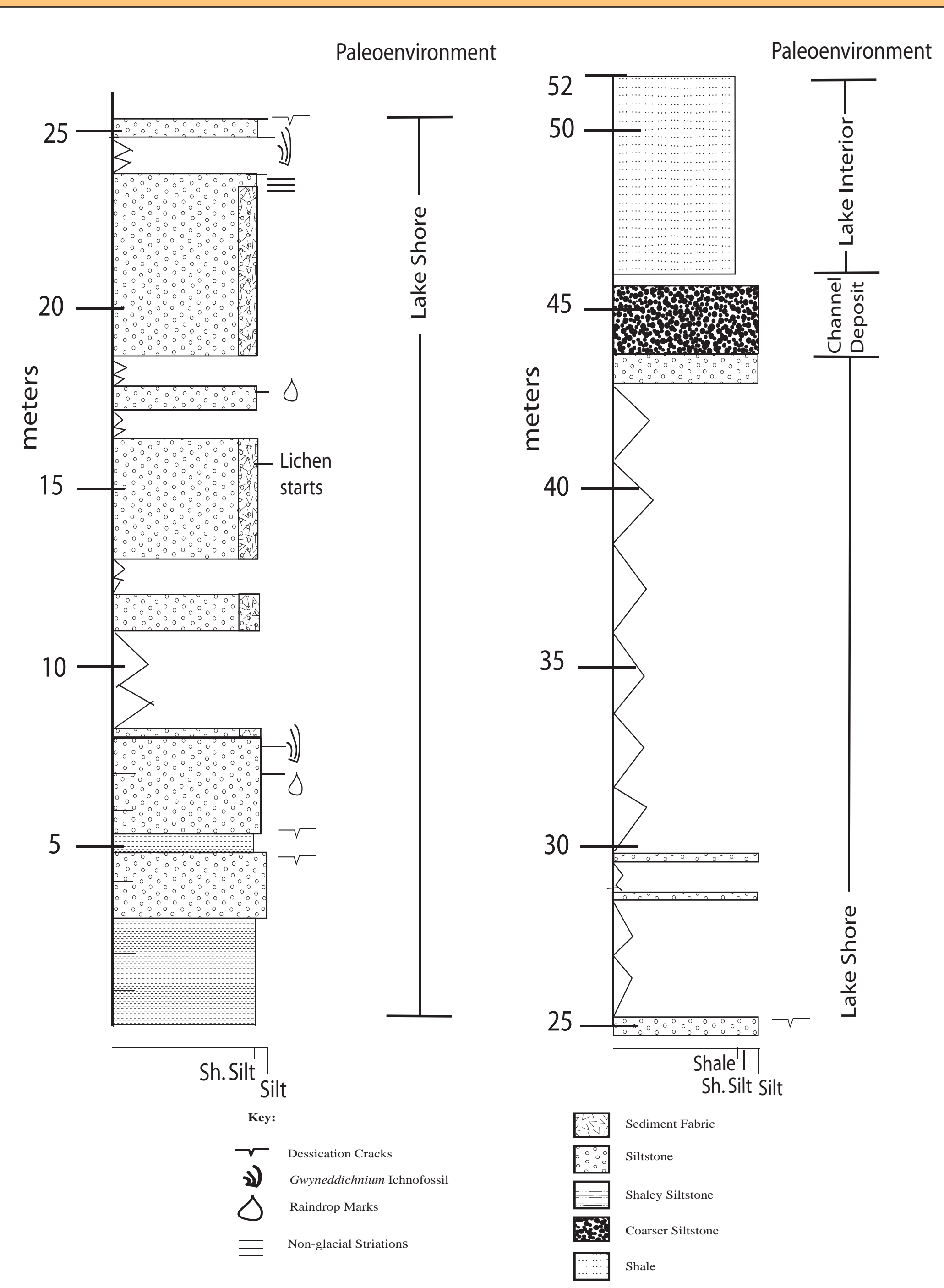
## Methods and Data

Methods included using a Brunton compass and a Jacob's staff to measure the section. Layers were examined for sedimentary structures and fossils. Hand samples were analyzed for grain size and shape, color, and texture.

Regional geology was examined by searching for outcrops, specifically looking for the boundary between the formations.



**Figure 2:** Photo of me measuring the section.



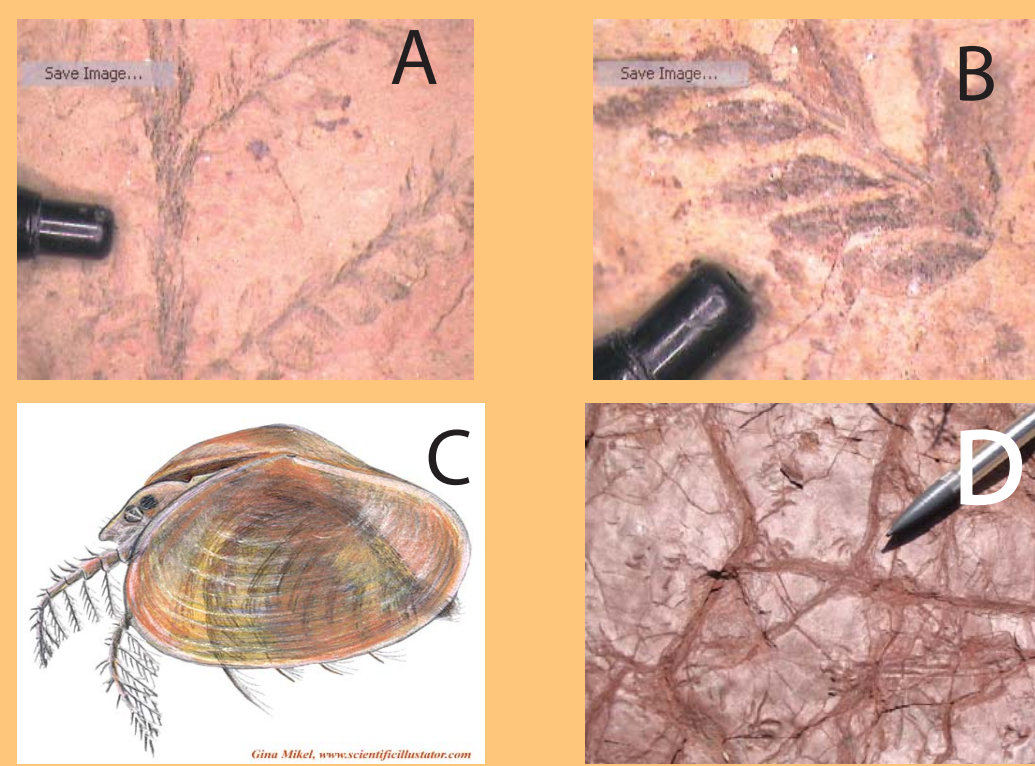
**Figure 3:** Measured section of the Fulton Site. Error on the meter measurements is +/- 4.16 cm.

This sections shows siltstones and shaley siltstones that are overlain by coarser siltstones and shales. This represents a lake shore environment (siltstones) that grades into the mouth of a river (coarser siltstones), eventually becoming a deep lake (shales). This lacustrine environment is indicative of the Gettysburg Formation.

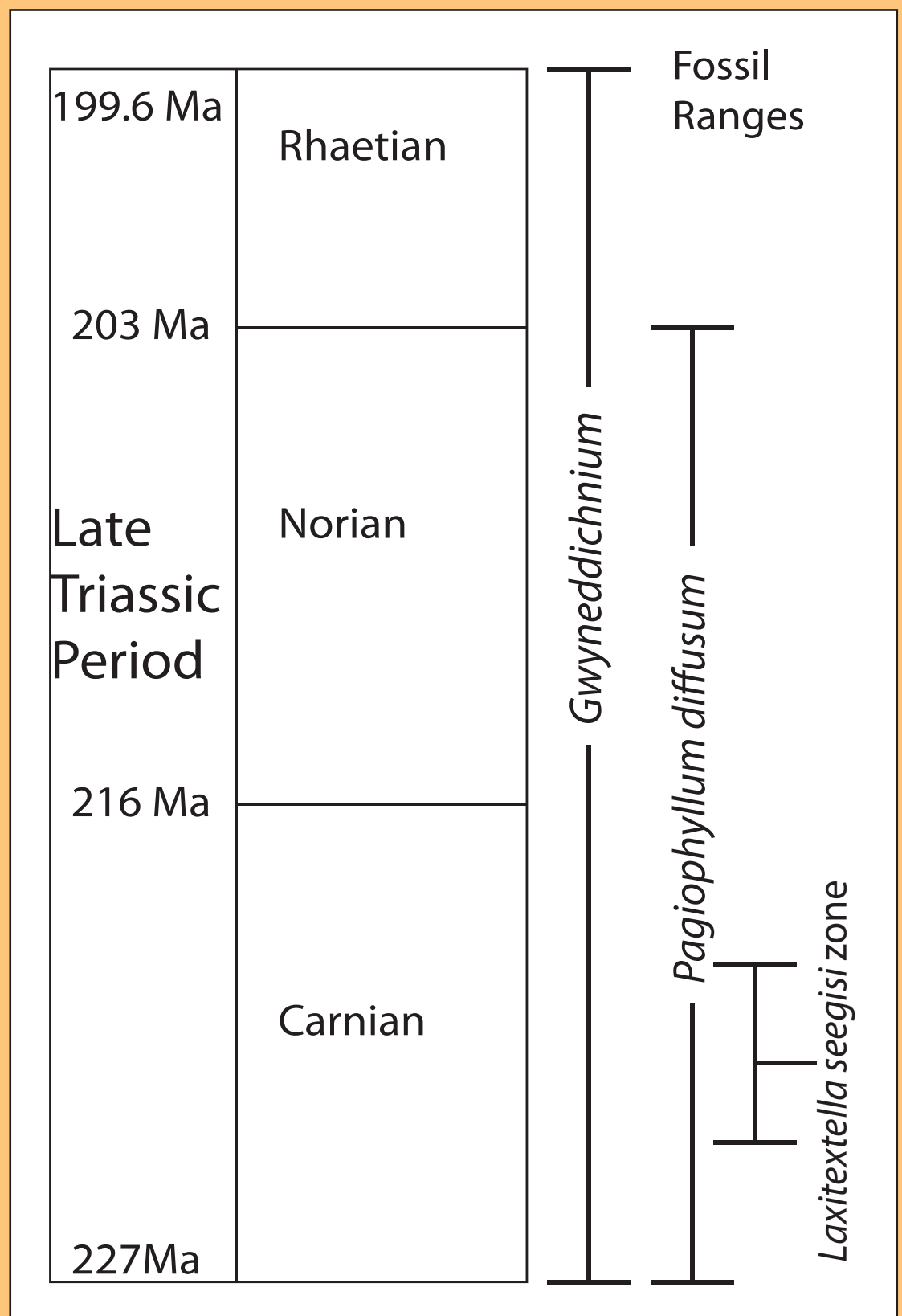
**Figure 4:** Topographic maps of the Fulton Site (red star) and surrounding areas. Black solid lines represent the boundary between the New Oxford Formation (striped blue) and the Gettysburg Formation (solid blue). Black dashed line represents where the contact is inferred. Purple line shows the transect I walked looking for lake cyclicity. Strike and dip measurements as shown.

## Fossils

The age obtained for the site using the above fossil material is between the Carnian and the Norian. The conchostracan data gave a Mid-Carnian age (Kozur and Weems 2007), but is in need of further analysis (Lucas and Tanner 2007). On a separate note, a small piece of eroded vertebrate bone was discovered in the float of the site. No analysis has been completed on this bone.



**Figure 4:** Fossil content of the Fulton site and neighboring areas. A) and B) *Pagiophyllum diffusum*; C) Illustration of a conchostracan; D) *Gwyneddichnium* trace fossils.



**Figure 5:** Biostratigraphic ranges of fossils from the Fulton Site.

## Discussion/Conclusions

### Lithology of the Fulton Site:

Shifting environments during the rifting of Pangea caused the boundary between the New Oxford and Gettysburg Formations to be time transgressive. That is, the stratigraphic location of the boundary shifted through time. This made it very difficult for the basins of the Newark Supergroup to be dated accurately. By characterizing the rocks, I assessed the paleoenvironments, which allowed me to distinguish the formations.

The Fulton Site comprises red siltstones and gray shales with lacustrine fossils. This indicates a lacustrine facies. The site was compared to the railroad cut, where the boundary between the formations is clear, and the New Oxford, a fluvial facies (crossbedded buff sandstones), is present. Strike and dip measurements show a syncline, and along with regional maps, I found that the boundary between the formations is East of the Fulton Site. All these lines of evidence point to the Fulton Site being in the Gettysburg Formation.

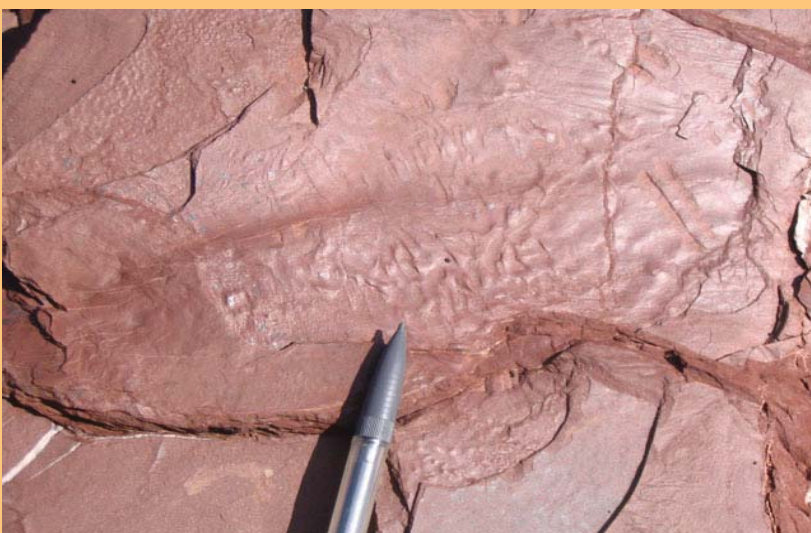
### Age of the Fulton Site:

The *Gwyneddichnium* trace fossils are dated to the Late Triassic. The plant fossils, all *Pagiophyllum diffusum*, are dated from the Carnian to the Norian. This plant is commonly from the *Dinophyton* Zone (Ash 1980), and the zone is dated to the Late Carnian based on palynostratigraphy (Cornet 1977). This is not to say that the plant does not survive into the Norian. The conchostracan analysis resulted in a Mid-Carnian age (Kozur and Weems 2007). This data was correlated to Germanic Basins of a similar age, but since the biostratigraphic succession of the Newark Supergroup could be different than that of Germany, this analysis is only preliminary and is in need of further testing. Even though Kozur and Weems provide a clear analysis of their data, there are inherent limitations to their work, given the scarcity of sites and specimens. As of right now, the age of the Fulton Site remains enigmatic, though it is most likely Carnian-Norian.

## Possible Environments

Facies	Fluvial	Alluvial Fan	Lake Margin	Lacustrine
Expected Sedimentary Structures	braided streams	debris flows	birdfoot deltas	mudflats (Fig. B)
	meandering streams	braided streams		
	crossbeds (Fig. A)		reworked alluvial fans	shallow lake beds
	overbank deposits	trough crossbeds		deep lake beds (Fig. C)

**Table 1:** Facies of rift basins and their corresponding sedimentary structures (Smoot 1991).



**Figure A:** Crossbeds from railroad cut.



**Figure B:** Red siltstones with desiccation cracks from Fulton site. Trace fossils present in other layers.



**Figure C:** Deep lake beds from Fulton Site.

## References

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## Acknowledgments

I have several people to thank for assisting me with this study. Firstly, my advisors (Tom Holtz, John Merck, Richard Fulton, and Robert Weems), all of which helped me throughout this yearlong project. Secondly, thanks to John and Linda Ballinger for allowing me to conduct this study on their property, and to their dogs, who kept me company while I was there. Thirdly, to my family and Josh Gold, who are constant sources of support and intellectual development. A quick thanks to Paul Olsen (Columbia University), Joe Smoot (U.S. Geological Survey), Thomas Lipka, and Brian Axsmith (University of Southern Alabama), who were all willing to lend a helping hand. Lastly (but not leastly), thank you Susan Drymala for the many times you came with me, and all the pictures you took, thank you Peter Skold for the competition, and thanks to David Tana and Kate Gold for the fun field days.