

**THE PALYNOSTRATIGRAPHY AND
AGE OF THE NEWARK SUPERGROUP**

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The Newark Supergroup consists of at least ten groups of rock, each contained within one or more basins (including outlier basins). These basins extend from South Carolina north to Nova Scotia mostly in the Piedmont physiographic province of eastern North America. This thesis presents a survey of new information on the geology, especially the palynostratigraphy, of these basins, based on detailed study of over one hundred palyniferous samples from eight of the groups. From this study seven stratigraphically distinct palynofloras are recognized, each of which has certain characteristics which distinguish it from the others.

The oldest palynoflora, the Chatham-Richmond-Taylorville palynoflora (recognized in the Chatham, Richmond, Taylorville, and Conewago Groups), contains about 155 palynomorph species. Age diagnostic species indicate mainly a late middle Carnian age. This palynoflora is gradually replaced (in the Conewago Group) by the New Oxford-Lockatong palynoflora (recognized in the Conewago and Novacaesarea Groups) of mainly late Carnian age. The New Oxford-Lockatong palynoflora is, in turn gradually replaced (in the Novacaesarea Group) by the Lower Passaic-Heidlersburg palynoflora (recognized in the Culpeper, Conewago, Novacaesarea, and Hartford Groups) of mostly Norian age. The Rhaetian is stratigraphically defined by the Manassas-Upper Passaic palynoflora (recognized in the Culpeper and Novacaesarea Groups). From stratigraphic relationships this palynoflora is probably present as well in the Conewago, Hartford, and Greenfield Groups, although no palyniferous localities have as yet been discovered. Altogether, about 286 palynomorph species have been recognized for the Upper Triassic portion of the Newark Supergroup.

Late Triassic palynofloras of the Newark Supergroup contain hundreds of new palynomorph species, some of which are important in time-stratigraphic correlation for the Newark. There are numerous differences in palynofloral composition from European assemblages presumably of similar age: for example, there is no significant turnover of species at the Carnian/Norian boundary as in western Europe, while there is considerable local "extinction" at the Triassic/Jurassic boundary. Non-striate bisaccates are highly diversified and abundant in the Norian and Rhaetian of the Newark Supergroup, which contrasts with their scarcity in rocks of similar age in Europe, even though circumpolles pollen is almost as abundant in the Newark Rhaetian as in that of western Europe. Certain types of pollen which are rare or absent in the Norian and Rhaetian of Europe, such as *Triadispora* spp. and *Patinasporites densus*, are sometimes common or abundant up to the top of the Triassic in eastern North America.

The Triassic/Jurassic boundary is palynologically well de-

defined in the Novacaesarea Group, and, based on stratigraphic and palynofloral relationships, is also present in the Culpeper, Conewago, Hartford, and Greenfield Groups. Jurassic palynofloras are somewhat monotonous in being strongly dominated by Corollina spp. Three Liassic palynofloras have been recognized: The oldest one is the Corollina meyeriana palynoflora of Hettangian-early Sinemurian age (recognized in the Culpeper, Conewago, Novacaesarea, Hartford, and Greenfield Groups). Stratigraphic correlations within the C. meyeriana palynofloral zone are dependent on fossil fishes. Based on these correlations, two subdivisions of this palynoflora have been recognized, which are supported by a subtle megafossil floral change.

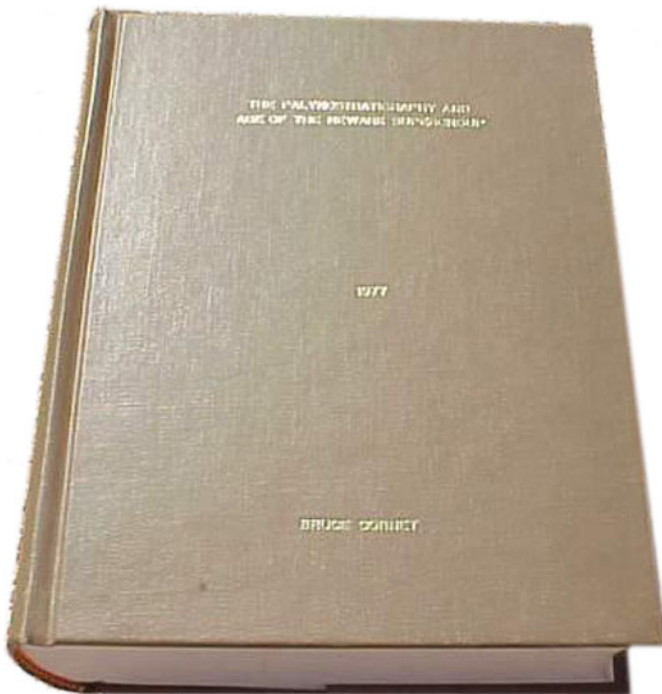
The C. meyeriana palynoflora is replaced by the younger Corollina torosus palynoflora (recognized in the Culpeper and Hartford Groups) of probable late Sinemurian-Pliensbachian age. Near the middle of the C. torosus palynofloral zone the megafossil flora again changes, with conifer species characteristic of an inland floral assemblage replacing species of a "coastal" assemblage. Toward the top of the C. torosus palynofloral zone palynomorph species generally indicative of the late Liassic first appear.

The C. torosus palynoflora is replaced by the Corollina murphyi palynoflora (recognized thus far only in the Hartford Group) of probable Toarcian age. The youngest strata of the Newark Supergroup (upper Portland Formation, Hartford Group) could be Middle Jurassic, based on stratigraphic thickness and correlation with the Mohawk Formation on the Scotian Shelf.

Each rock group within the Newark Supergroup covers a particular age range. The Richmond and Taylorsville Groups (upper middle Carnian) are more or less coeval, but are generally somewhat older than the Chatham Group. The Chatham and Dan River Groups (upper middle-lower upper Carnian) seem to overlap in age the older part of the Conewago and Novacaesarea Groups (upper middle Carnian-Liassic). The Culpeper, Hartford, and Greenfield Groups (Norian-Liassic, and possibly younger) are significantly younger than the Chatham, Richmond, or Taylorsville Groups, and overlap in age much of the younger part of the Conewago and Novacaesarea Groups. The Hartford Basin contains the youngest strata in the Newark Supergroup, and records the final stages of Newark activity.

The Newark Supergroup records the beginning of incipient rifting between the African and North American continental plates in the middle Carnian (about 213 m.y.). As incipient rifting gathered momentum, new basins developed throughout the Late Triassic. Near the beginning of the Jurassic igneous activity erupted in the form of flood basalts. Incipient rifting reached its climax in the early Liassic at the time of the Palisades intrusive event (190 m.y.), but significant plate movement (active rifting with production of oceanic crust) may not have occurred until the middle Liassic. The first indication of plate movement may be the coastalward shift of an inland floral assemblage in the Pliensbachian. The number of actively subsiding basins gradually decreased through the Liassic

until only the Hartford Basin was receiving sediment in the Middle Jurassic. The end of Newark activity at about 167 m.y. is about 23 million years after the Palisades intrusive event, which occurred midway through the history of the Newark Supergroup. Thus, the Newark spans about 46 million years, which is more than twice the amount of time generally given to the Newark Supergroup before this study began.



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