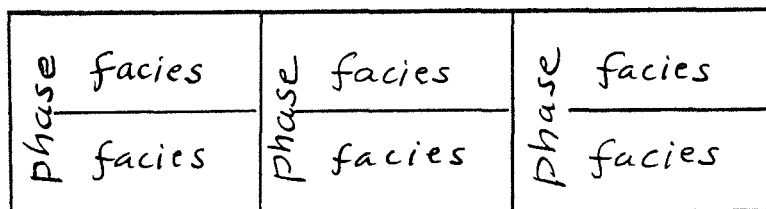


STRATIGRAPHY

The general stratigraphic section of the Cayuga Lake Region is shown on the section opposite this page. Analysis of the distribution of fossils throughout the Devonian indicates that the faunal succession is not at all simple; throughout there are different faunas, some of them apparently disappearing and reappearing in a perplexing manner. Further, from the section it is apparent that the lithology of the rocks varies, with different kinds appearing and disappearing, often reappearing again higher up. The lithology of a sedimentary rock unit reflects, of course, the sedimentary and aqueous environment in which it was laid down. Similarly, the fauna living where a certain type of sediments is being deposited is closely adjusted to that particular environment. Once this is understood, similarity of faunas in different formations having the same lithology is to be expected, and the differences in such faunas in the same rock types up and down the column are due primarily to the effects of evolution with time and intermingling. Because of this complexity of fossil faunas, the Devonian stratigraphy of this region is still, after 120 years of study, not thoroughly worked out. Here only the broad features of the interrelationships of the lithologies and faunas can be outlined.

The upward continuation in time and in the geologic column of the same lithology containing similar fossil faunas is a phase. Thus, referring to the chart of New York Devonian relationships opposite p. 8, the similar lithologic and overall faunas of the eastern part of the Hamilton-Tully-Ithaca-Enfield succession represents a phase. At any one time in the column two or more phases may exist side by side in the area of deposition, as for instance during Ithaca time, when the Naples Fauna with its characteristic lithology occupied the area to the west, the Ithaca Fauna to the east, and still farther eastward was the continental Catskill Fauna and Flora. Each of these segments of three phases is a facies. Diagrammatically the relations of phases and facies may be represented as follows:



The relations actually are never so neatly defined as shown above and in the Cayuga Lake Basin they are more nearly as shown in the diagram, p. 9. Here only the east-west relations are indicated. A more complete picture could, of course, be prepared if the north-south relations were known. Further, it is found that each of the phases and facies can be divided into subphases and subfacies reflecting slightly different environments within each. The problem of nomenclature for these relations is complex and only broad terms are used here. There is yet work to be done.

Lower Devonian

Only a few feet of Lower Devonian (Helderbergian) rocks exist in this region, where the nearly unfossiliferous Rondout and the overlying sparsely fossiliferous Manlius limestones, totalling about 50 feet, represent the western edge of the thicker rocks to the east, and rest with slight unconformity on the Cobleskill limestone, the latest Silurian formation. The Cobleskill-Rondout-Manlius sequence represents the slow and incomplete return to normal marine conditions following the salt-gypsum depositional environment of the Late Silurian (for brief summary of latest views, see Rickard, 1955).

The Manlius fauna is sparse and when found consists of large numbers of individuals representing a few species, a condition suggestive in this case of still higher than normal salinity. Typical forms are the brachiopods Howellella vamuxemi and Orthotetes interstriata, the ostracod Leperditia alta, and the "pteropod" Tentaculites.

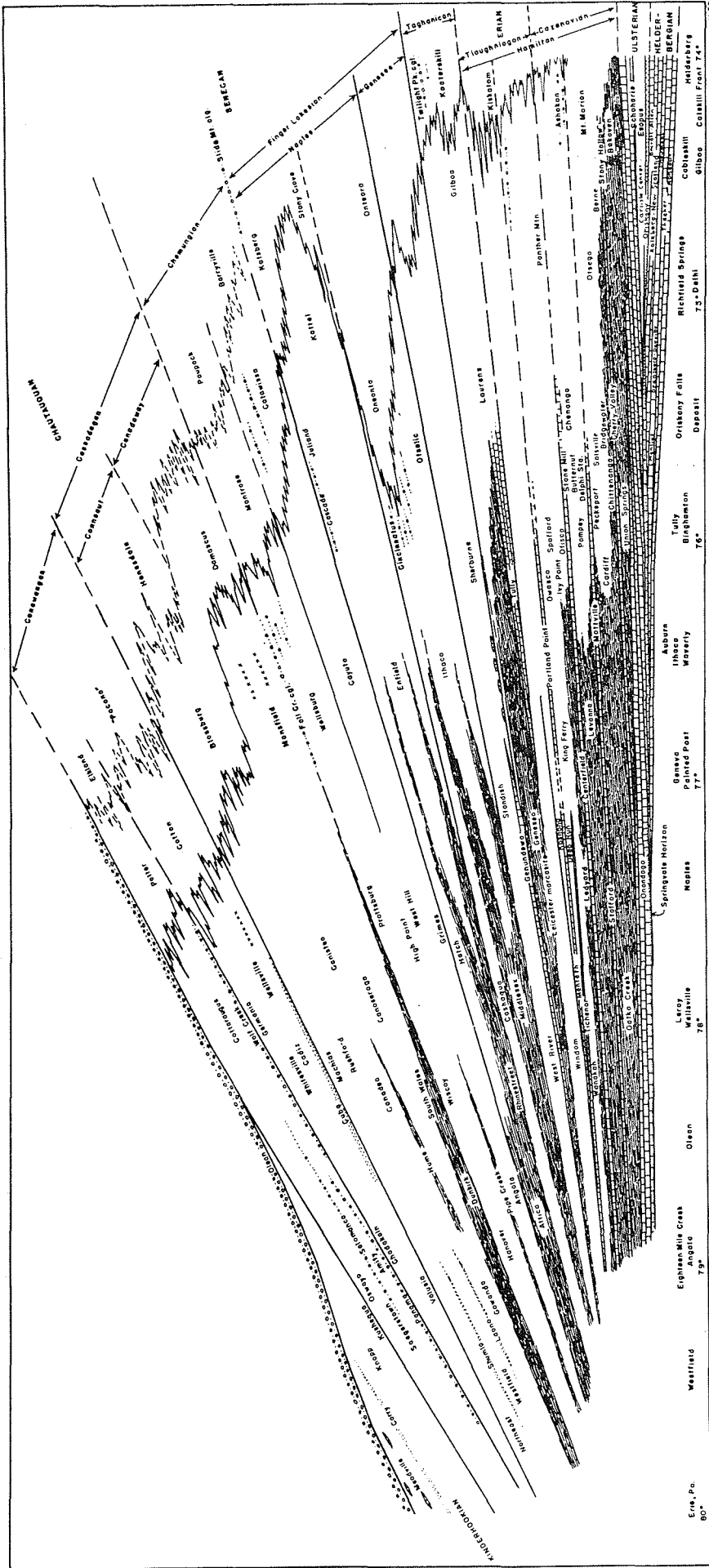
Uplift at the close of the Helderbergian resulted in extensive erosion of these limestones before renewed subsidence began in the Middle Devonian (Ulsterian). The weathering products of the limestones presumably supplied the material for the transgressive Oriskany sandstone.

Middle Devonian

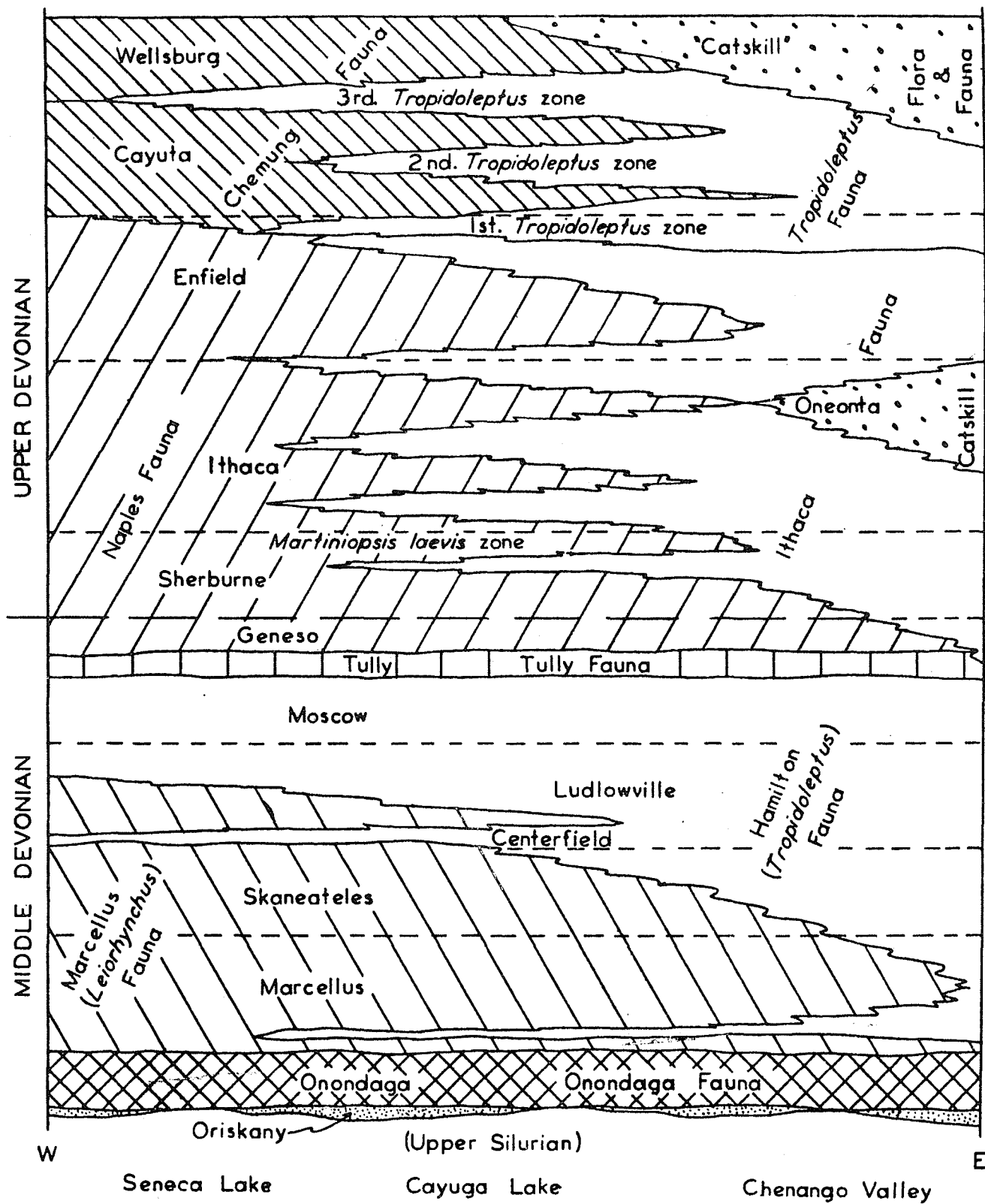
The Oriskany sandstone, representing the deposits of a renewed advance of the sea at the commencement of Middle Devonian time, is marked in the Cayuga Lake Region by its fauna of mostly large brachiopods, Rensselaeria, Meristella, Costispirifer, Acrospirifer, Hipparionyx, Costellirostra, and Chonestrophia. Other types are rare: Platyceras, Cyrtolites, Tentaculites, Modiomorpha, and Pterinea. Few of the genera and species continue upwards in this area into the overlying Onondaga limestone.

The faunas of the Onondaga limestone and overlying Hamilton group include facies faunas of three phases: Onondaga normal limestone phase, Hamilton normal shale phase (Tropidoleptus-Mucrospirifer Fauna), and the Marcellus dark to black shale phase (Leiorhynchus Fauna). The Onondaga is characterized by the abundance of corals (rugose, tabulate, and stromatopoid), crinoids, brachiopods (Paraspirifer, Fimbrispirifer, Leptaena, Meristella, Pentamerella, Atrypa, Megastrophia), rare pelecypods, gastropods, often large (Platyceras, Pleuronotus, Platyostoma), cephalopods (Spyroceras, Ryticeras, Goldringia) and trilobites (Anchiopsis, Calymene, Coromura, Odontocephalus, Phacops, Proetus). This is the clear water, shelf phase of the Middle Devonian in areas distant from the influx of clastics from landmasses where life conditions were at the optimum. In places coral-reefs are developed.

The Hamilton Fauna represents, on the other hand, the nearshore phase with muddy bottoms and less favorable conditions for many groups, especially corals and pelmatozoans (stromatopoids, for instance, are unknown in the Hamilton in this region, but are common farther to the west in Michigan where ecologic conditions similar to those of the Onondaga continued into Hamilton time). For some groups, such as pelecypods, the Hamilton conditions were more favorable than in the Onondaga.



GENERALIZED EAST-WEST SECTION, DEVONIAN OF NEW YORK (ADAPTED FROM CHADWICK).



DEVONIAN FAUNAL RELATIONS IN
CENTRAL NEW YORK
(DIAGRAMMATIC)

Characteristic of the Hamilton faunal facies are the brachiopods: Tropidoleptus, Mucrospirifer, Spinocyrtia, Brachyspirifer, Rhipidomella, Pustulina, Camarotoechia, Eunella, Ambocoelia, Athyris, Stropheodonta, Protolaptostrophia, Douvillina; pelecypoda: Modiomorpha, Cypricardella, Cornellitites, Aviculopecten, Goniophora, Grammysia, Orthonota, Panenka, Nucula, Palaeonello, Glyptodesma, Actinopteria; gastropods: Bambexia, Loxonema, Platyceras, Platyostoma; cephalopods: Michelinoceras, Spyroceras, Nephriticeras, Tornoceras; trilobites: Dechenella, Phacops, Dipleura, Greenops; bryozoa, tabulate and rugose corals (but rarely in any such abundance as in the Onondaga); echinoderms: crinoids (Gemmaecrinus, Ancyrocrinus, Dolatocrinus, Taxocrinus), blastoids (Devonoblastus); and other groups.

The Marcellus Leiorhynchus facies fauna, composed of few species and sporadic occurrence of large numbers of individuals, occurring in fine-grained dark to black, rarely calcareous muds, was contemporaneous with the Onondaga and Hamilton faunas but represents a phase of environment where bottom conditions were unfavorable, even for mud-loving types. Such areas were probably well off-shore with poorly oxygenated water. Characteristic forms are Leiorhynchus, Orbiculoidea, Pterochaenia, Panenka, Styliolina, and occasional wanderers from more favorable sites.

After the close of Onondaga time the Cayuga Lake Basin was occupied alternately during the ensuing Hamilton time by the Tropidoleptus and Leiorhynchus facies faunas, whenever the conditions for either existed (see chart of faunal relations), with a tendency for the Tropidoleptus fauna to extend its area of occupancy farther and for longer periods as time went on.

At the close of Hamilton time, conditions for deposition of more nearly normal limestone developed with the deposition of the Tully limestone. (Trainer, 1932; Cooper and Williams, 1935). During this time the Hamilton fauna continued to occupy the region but it was modified slightly but very distinctly by immigration of Eurasiatic elements from the west or northwest where these elements had existed, during the latter part of Hamilton time, as part of the well-known Stringocephalus provincial fauna of Europe, Asia, and northwestern North America. Genera indicative of this minor and first invasion of "foreign" forms into the Tully sea are: Hypothyridina, Scutellum, and Sphaerospongia. These elements, however, disappeared at the close of Tully time, when the Hamilton fauna also moved elsewhere from the Cayuga Land and New York Region, as the old Marcellus fauna, now considerably modified and reappearing as the "pre-nuncial" Naples facies fauna, marked by an influx of "foreign" pelagic goniatites such as Ponticeras, returned during Genesee time at the beginning of the Late Devonian.

Upper Devonian Faunas

The Ithaca facies fauna is a modified, less varied Hamilton facies fauna adapted to slightly less favorable conditions, and lacking many common Hamilton forms such as corals and trilobites, and some brachiopods, notably Tropidoleptus, but with a few new types such as Platyrachella mesastrialis, Mucrospirifer posterus, Schizophoria impressa, Cryptonella eudora, etc. In turn the Chemung fauna is a modified Ithaca fauna with

new forms such as Cyrtospirifer chemungensis, C. perlatus, Cornellites chemungensis and C. nodocosta, while the Canadaway is marked by diminished and modified Chemung species and the appearance of Cyrtospirifer inermis and Athyris angelica. At several horizons in the upper Enfield and Chemung formations there are recurrences of the earlier Tropidoleptus fauna, modified by time and an excursion elsewhere since the end of Tully time with Tropidoleptus, Cypricardella, Rhipidomella, Spinocyrtia marcyi, Phacops, etc.

The Naples facies fauna, dominant in the lower Upper Devonian to the west, appears in the Cayuga Lake Basin at several horizons in the Genesee ("prenuncial"), Sherburne, Ithaca, and Enfield, and interfingers with the Ithaca fauna. It is characterized by its largely pelagic and occasional benthonic elements, such as Manticoceras, Honeycoyca, Buchiola, Paracardium, Orbiculoidea, Leiorhynchus, Styliolina, Pterochaenia, etc. It is similar to, and a modified version of the earlier Marcellus Leiorhynchus facies fauna, with immigrant Eurasiatic elements and generally adapted to less rigorous conditions than the dark-black shales. Eastward the Warrenella ("Martiniopsis", "Reticularia") laevis subfauna, with more benthonic types, including Plumalina plumaria, the curious feather-like hydroid is developed, especially in the Cayuga Lake Basin.

The Catskill phase of continental or subcontinental deposits, with land plants, freshwater fishes, and freshwater mussels, is more or less continuously developed to the east of the Cayuga Lake Basin, but enters the area only in the Late Devonian to the south near the Pennsylvania line. Fragments of plants and fish of the Catskill phase are occasionally found in the Middle and Upper Devonian marine beds into which they were washed or drifted from the east.