

REVISIONS IN THE GEOLOGY OF SARATOGA SPRINGS, NEW YORK AND VICINITY

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ABSTRACT. Evidence is presented to substantiate a radical change in the interpretation of the Paleozoic stratigraphy of the Saratoga Springs region. The previously accepted sequence of beds (Potsdam sandstone, Theresa formation, Hoyt limestone, Little Falls dolomite, Amsterdam limestone, Trenton limestone, Canajoharie shale) is revised to read Potsdam sandstone, Galway formation, Hoyt limestone, Ritchie limestone, Mosher-ville sandstone, Gailor dolomite, Lowville limestone, Amsterdam lime- tone, Trenton limestone (Rockland ? , Hull, Sherman Fall representa- tives) and Canajoharie shale. As the term "Theresa" is not applicable in this area, the name Galway formation is reintroduced for strata younger than Potsdam and older than Hoyt. Lower Ordovician beds have been traced into the Saratoga region from the Mohawk Valley and constitute most of the dolomite which has heretofore been regarded as Little Falls dolomite (Upper Cambrian). A revised geologic map of the Saratoga region is presented embodying the results of the investigation.

INTRODUCTION

WHILE the senior author was engaged in geologic investi- gation of the Lower Ordovician strata of the Mohawk Valley, it became increasingly apparent that further informa- tion was essential before accurate stratigraphic interpretations could be established. The position of the Cambrian-Ordovician boundary was perplexing, as unfossiliferous dolomites conform- ably underlying beds with an indisputable Ordovician Tribes Hill fauna revealed no evidence as to their correct geologic age. In the hope of finding a solution, the present authors focused their attention on the critical, more fossiliferous, classic local- ity to the northeast, that of Saratoga Springs and vicinity. In doing so they found that the previously accepted succession of beds was not the true one (fig. 1, revised and former strati- graphic columns); consequently the geologic map of the re- gion was modified so as to conform to the new field evidence (figs. 2a and 2b).

The writers examined in detail the southern half of the Saratoga quadrangle, and also vital adjacent areas in the Mohawk Valley where more complete sections, unaffected by faulting, are available. Fisher restudied the southern portion of the Broadalbin quadrangle in an effort to trace the beds

due westward. The formations under consideration are cut off to the east by normal faulting, bounded on the north by the Precambrian rocks of the Adirondack mountains and overlain to the south by Mohawkian Canajoharie shales and Schenectady shales and sandstones.

PREVIOUS WORK

It is not the authors' intention to present an exhaustive resumé of all the papers dealing with the Saratoga region but only to mention the articles pertinent to the problem in question.

As early as 1879, Walcott (p. 131) established the age of beds now referred to as the Hoyt limestone when he listed Upper Cambrian fossils from the Hoyt quarry, 4 miles west of Saratoga Springs.

Prosser (1900, pp. 477-480), the first to publish detailed sections of the region, recognized the limestone at Rock City Falls as Trenton in age. Cushing and Ruedemann (1914, p. 46) labelled this limestone the Amsterdam limestone, stating that it was older than the Trenton.

Ulrich and Cushing (1910, pp. 106-112) published a few sections of the area in conjunction with their stratigraphic study of the Little Falls dolomite which they claimed could be traced from its type locality at Little Falls, New York around the southern Adirondacks to Whitehall. Introducing the name Hoyt limestone for the fossiliferous more calcareous phase of the Upper Cambrian in this area, they relegated it to the base of the Little Falls dolomite (p. 99). They further proposed the name Tribes Hill limestone for the calcareous fossiliferous strata of Ordovician age which unconformably overlay the Little Falls dolomite in the Mohawk Valley but which they claimed was absent from the Saratoga region.

Clarke (1910, p. 12) introduced the term Galway formation but it has never since appeared in the literature. To quote Clarke, "A series of distinctly transitional beds lies between the Potsdam sandstone and the Little Falls dolomite. This formation has been named from the town of Galway where it is best shown and it has been separately shown on the geologic map." If the map referred to was the geologic map of the Broadalbin quadrangle which was in preparation at

GENERALIZED STRATIGRAPHY OF THE SARATOGA AREA

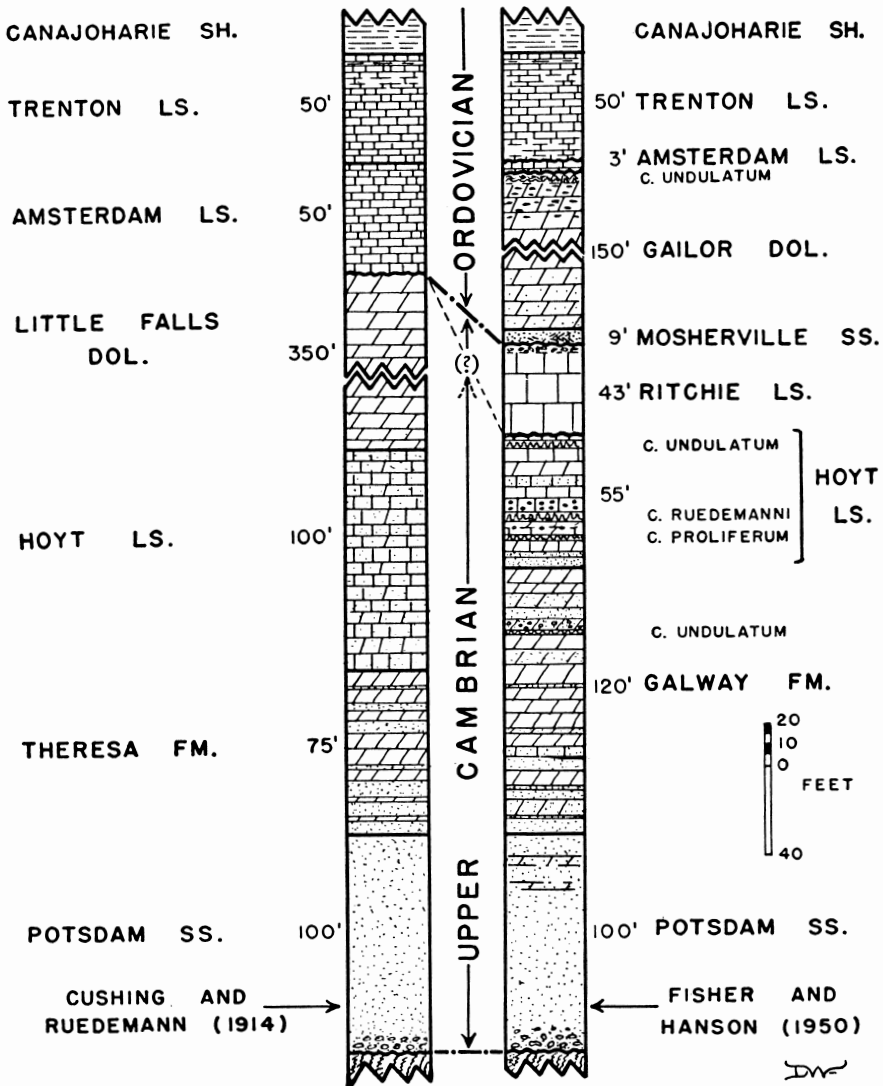


Fig. 1

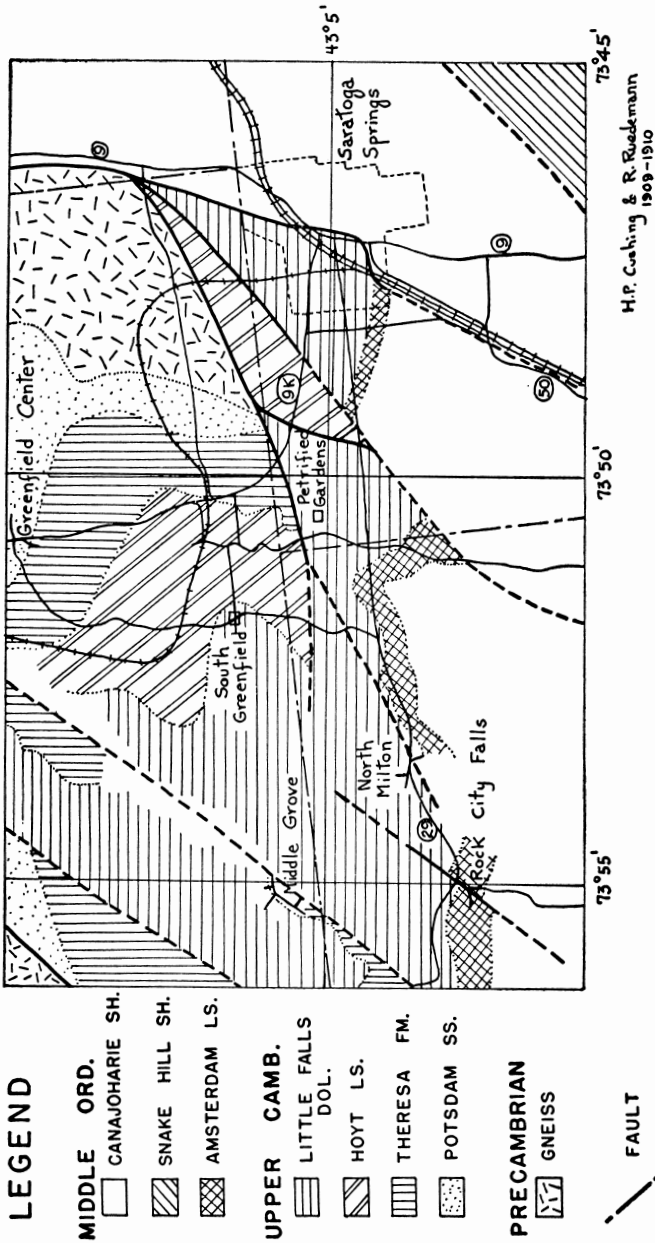


Fig. 2a

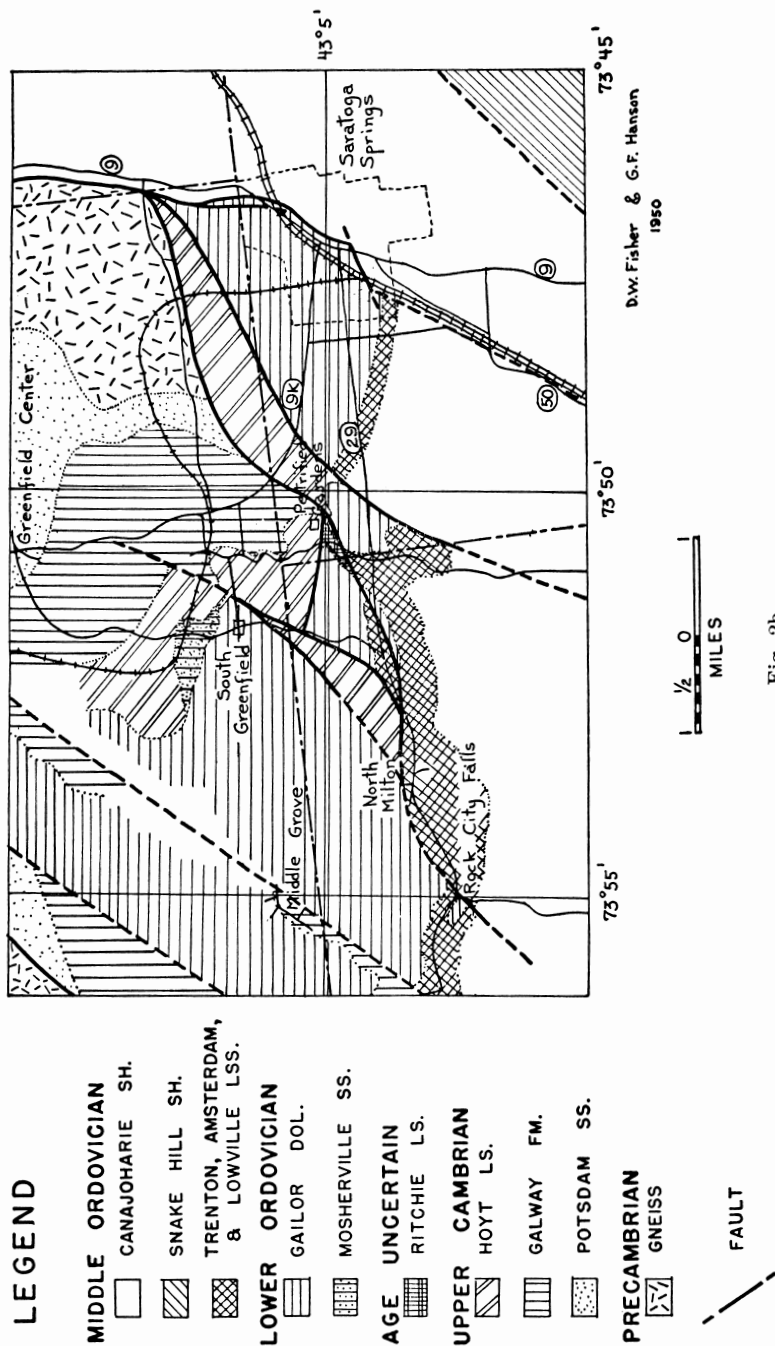


Fig. 2b

this time, the name was dropped, for Miller calls this formation the Theresa formation (1911, p. 28).

In his report on the geology of the Broadalbin quadrangle, Miller (1911, pp. 29, 33) reported that the Hoyt and Tribes Hill limestones were absent from the region, the former probably changing to dolomite and therefore included in the "Theresa" formation while the latter was probably deposited but eroded in pre-Black River time.

An excellent study of the Potsdam-Hoyt fauna with included photographs was presented by Walcott (1912) in which he refers this fauna to the uppermost Cambrian.

A geologic map of the Saratoga quadrangle was prepared by Cushing and Ruedemann (1914) in which all of the dolomite occurring above the Hoyt was regarded as Little Falls dolomite and most of the limestone overlying this as the Amsterdam limestone. They classed the Hoyt as an upper local phase of the "Theresa" formation and indicated a thickness of 300 to 400 feet for the Little Falls dolomite in the region. In this paper they proposed the name Hoyt (p. 38) in place of Clarke's name Greenfield limestone which was preoccupied, but actually the name Hoyt had appeared in the literature four years prior, having been used for these beds by Ulrich and Cushing (1910, p. 99).

Colony (1930) contributed several corrections to the geology of the area though his study mainly related to the mineral waters of the vicinity. He clearly recognized exposures of

Plate 1.

Fig. 1. *Elvinia ruedemanni* Resser (x 1), exceptionally well preserved free check showing the very narrow genal spine. Galway formation.

Fig. 2. Cranium of same species (x 1). Galway formation.

Fig. 3. *Berkeia saratogensis* Resser (x 2). Galway formation. Preservation is poor due to the coarse lithology of the rock.

Fig. 4. Cranium of *Plethopeltis saratogensis* (Walcott) (x 1). Hoyt limestone, Lester Park, directly below the *Cryptozoon proliferum* reef.

Fig. 5. *Prosaugia eboracensis* (Resser) (x 1). Hoyt limestone, railroad cut east of Greenfield, below the *Cryptozoon* cf. *undulatum* reef.

Fig. 6. *Plethometopus* sp. (x 1). Galway formation. Railroad cut just west of route 9-K, 3 miles west-northwest of Saratoga.

Figs. 7, 8. Weathered specimens of a gastropod allied to *Rhachopea* (x 2). Ritchie limestone, south of "Petrified Gardens."

Fig. 9. *Helicotoma* (?) *uniangulata* (Hall) (x 1/2). Weathered mold from Gailor dolomite, northeastern portion of Amsterdam quadrangle.

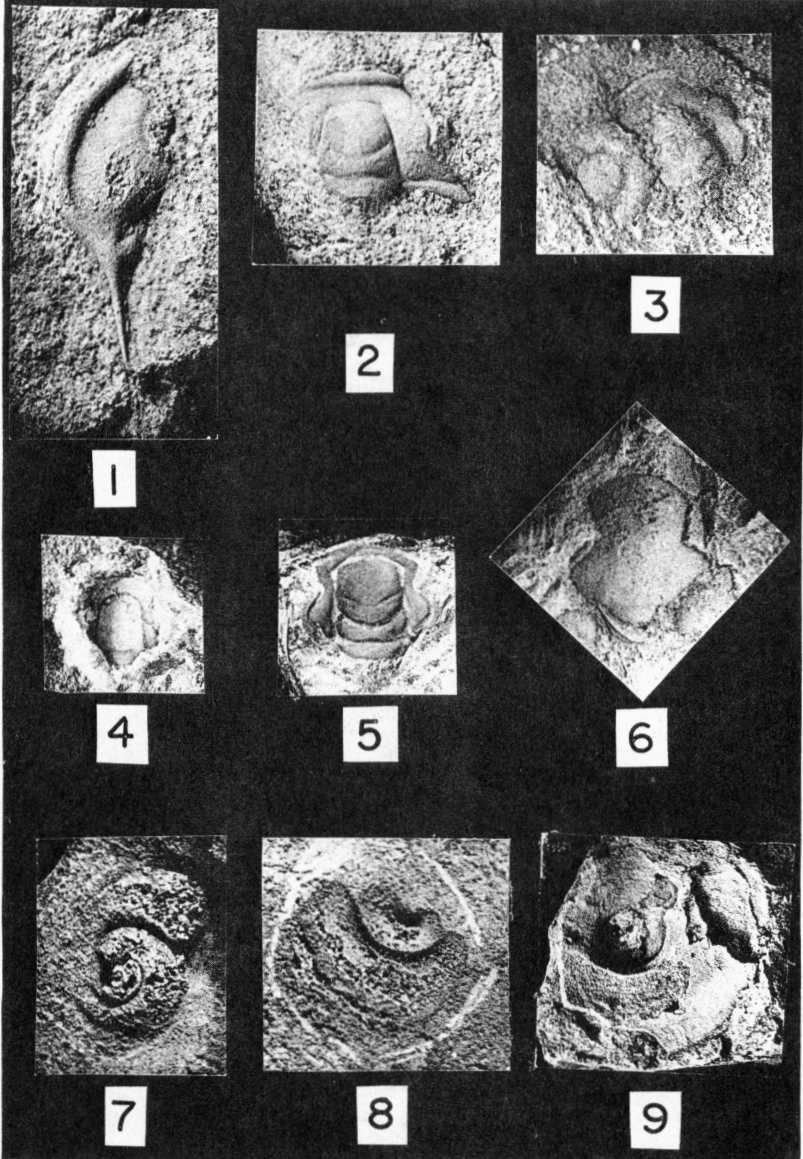




FIG. 1



FIG. 2

Trenton age in the area, and his photomicrographs of the various strata have proved of considerable aid to the present writers.

Kay (1937, p. 254) asserted that the limestone at Rock City Falls is entirely Hull (Larrabee) in age with perhaps 4 feet of Amsterdam limestone intervening between it and the underlying "Beekmantown" dolomite. This is the first published statement ascribing any rocks in the region to the Canadian.

In her elaborate paper describing the *Cryptozoon* of the vicinity, Winifred Goldring (1938) furnished valuable information by mapping the outcrops of *Cryptozoon*; this material aided in the revision of the areal geology of the region.

The first to suggest in print that the long-accepted stratigraphy of the region was not the true one was Wheeler (1942, pp. 521-524) who stated that the Hoyt limestone overlay the Little Falls dolomite in the Saratoga region and that the persistent dolomite which overlay the Hoyt was a younger formation to which he applied the name Skene dolomite. He classified the Hoyt limestone as the basal member of the Whitehall formation and the Skene as the upper member, the latter being a very late Upper Cambrian offlapping unit. It is evident that he mistook the Ordovician Gailor dolomite for the older Little Falls dolomite, for the Hoyt and his supposed "Little Falls" are in fault contact in his "un-faulted" area 4 miles west of Saratoga Springs.

DISCUSSION

Unfortunately, the problem of deciphering the stratigraphic superposition of beds in this vital region is complicated by the fact that the sections are structurally isolated by repeated normal faulting. Furthermore, formational contacts,

Plate 2.

Fig. 1. Fault zone, 8 feet wide and 26 feet high, in the south wall of the abandoned Gailor quarry at the northern edge of Saratoga Springs, N. Y. Note the marked U-shape of the body of the thin-bedded Amsterdam and Trenton limestones and the thick-bedded character of the Gailor dolomite.

Fig. 2. Exposure along Kayaderosseras Creek at Rock City Falls just east of dam. Mr. Fisher is standing on the Lowville limestone, pointing to the contact of the Amsterdam and Trenton limestones. The Lower Ordovician Gailor dolomite is exposed at water level.

the key to analyzing proper stratigraphic succession, are rarely exposed.

Outcrops of Potsdam sandstone are rare and its areal extent is largely inferred from the preponderance of white sandstone in the glacial drift. Field examination suggests that this formation may be more restricted than appears on the map, but for lack of concrete evidence few changes have been made.

Because the "Theresa" formation has been poorly defined, and because it embraces both Upper Cambrian and Lower Ordovician strata in the type area near Theresa, New York, it seems improper to apply this term to beds between the Potsdam sandstone and Hoyt limestone. For this reason the authors suggest that the name Galway formation, originally introduced by Clarke (1910, p. 12), be substituted for the beds previously termed "Theresa" in this region. The formation is redefined to comprise the sandy dolomites, dolomitic sandstones, and calcareous sandstones lying below the Hoyt limestone and above the Potsdam sandstone. The *Elvinia* zone carrying *Elvinia ruedemanni*, *Camaraspis* sp., and *Berkeia saratogensis* is some 25 feet above the base of the formation, whereas the *Plethometopus* zone is some 40 feet above the *Elvinia* zone (plate 1, figs. 1-3, 6). The formation has a total thickness of approximately 125 feet in the area, and its top lies 12 feet below the *Cryptozoon proliferum* reef of the Hoyt limestone. Strata formerly classed as lower Hoyt are now included in the Galway formation because of the great similarity of lithology. As a mappable lithologic unit, the Galway formation embraces beds of lower Franconia through lower Trempealeau age. No faunal evidence for strata of middle or upper Franconia age was found; hence there may be an undetected break within the Galway formation in this area. The most fossiliferous section known to the authors is 2½ miles west-northwest of Saratoga Springs along New York State Highway 9-K, where a road cut and two adjacent railroad cuts expose these strata. This section is given in a subsequent portion of this article.

The Hoyt limestone was found to have a maximum thickness of 55 feet with only some 40 feet showing in the neighborhood of Lester and Ritchie parks rather than the 100 feet allotted to it by Cushing and Ruedemann (1914, p. 36). It

RESTORED SECTION SHOWING DETAIL
OF THE CAMBRIAN - ORDOVICIAN BOUNDARY
IN THE VICINITY OF SARATOGA SPRINGS, N.Y.

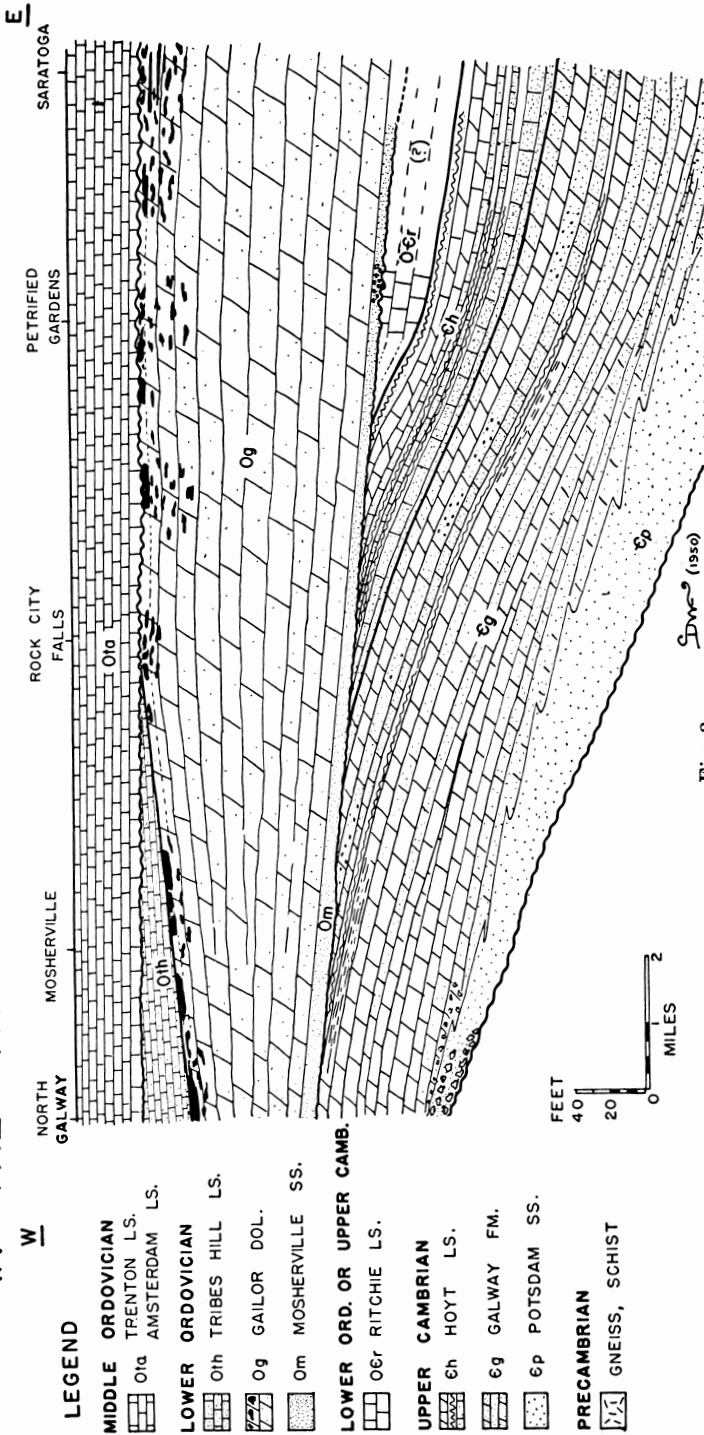


Fig. 3

does not occur to the west within the Broadalbin quadrangle. Its restricted geographical extent is due to truncation, the unconformity at its summit causing the Hoyt to wedge out in a westwardly direction (fig. 3). The three algal reefs formed of *Cryptozoon proliferum*, *C. ruedemanni*, and *C. cf. undulatum*, were used advantageously in the course of mapping for they proved to be reliable horizon markers. According to Miss Goldring (oral communication), the last-named reef is not conspecific with the type specimen of *Cryptozoon undulatum* but is similar to it. Another *Cryptozoon cf. undulatum* reef was also utilized in mapping, but this occurs directly beneath the *Plethometopus* zone of the Galway formation.

Some perplexity arose when *Prosaukia*, a trilobite supposedly indicative of an Upper Franconia age, was collected from beds stratigraphically higher than beds containing *Plethometopus*, a Trempealeau form (plate 1, figs. 4-5). The former was found to range from the lower Hoyt well up into that formation, and the latter was identified from the middle Galway. In the face of what appeared to be either an inversion of accepted trilobite zones, or a recurrent fauna, an exhaustive effort was made to clarify the puzzling situation.

Dr. R. H. Flower of the N. Y. State Museum verified the author's identification of *Plethometopus*. As to the *Prosaukia*, Rasetti (1946, pp. 541-542) reviewed and revised *Saukia eboracensis* of Resser assigning it to *Prosaukia*. It appears then, that *Prosaukia* ranges much higher than the Cambrian correlation chart (1944) would indicate. Nonetheless, if the trilobite zones of this chart possess validity, then there is a hiatus of some magnitude in this region, for no faunal proof of middle or upper Franconia or middle Trempealeau age could be found. Although further research into the zonation of the Hoyt fauna is necessary, some observations can be briefly recorded at this time. *Keithiella speciosa* and *Saratogia calcifera* appear to be restricted to the upper Hoyt, whereas *Plethopeltis saratogensis* ranges from beneath the *Cryptozoon proliferum* reef to the top of the formation. *Prosaukia eboracensis* has been found from the *Cryptozoon ruedemanni* reef upwards. The generic affinities of Walcott's "Dikellocephalus hartii" are not known at this writing.

Just south of the property of Mr. Ritchie (Petrified Sea Gardens), 43 feet of an exceedingly massive white weathering

blue-gray calcilutite, only slightly dolomitized, is exposed (see section under subsequent heading). The dearth of unpre-occupied geographical names necessitates the assigning of the name of the property owner of the adjacent Petrified Sea Gardens to these beds. The formation is exposed here because of faulting, for it occurs at the eastern apex of the horse formed by the bifurcation of the McGregor fault. Possibly the measured thickness is excessive, for a smaller tear fault may bring about repetition of a portion of the composite section. Apparently the Ritchie limestone is unconformably underlain by non-cherty dark gray coarse-grained dolomite of the upper Hoyt and unconformably overlain by 7 feet of conglomerate composed of dolomite cobbles in a sand matrix. The latter grades laterally into a coarse sandstone with well rounded quartz grains, which grades rather abruptly upward into a cherty arenaceous blue-gray dolomite with a Lower Ordovician fauna. The coarse clastic layer is interpreted as the Mosherville sandstone and the dolomite as the Gailor dolomite, both of which are described in succeeding paragraphs. Although the stratigraphic position of the Ritchie limestone is firmly established here, an effort was made to locate the formation elsewhere but to no avail. The sole exposure yielded some poorly preserved weathered specimens of a single species of gastropod allied to *Rhachopea* (plate 1, figs. 7-8). An exhaustive search failed to disclose any further fossils. *Rhachopea*, while present in the Upper Cambrian Eminence formation of Missouri, is a more abundant form in the Van Buren and Gasconade formations there.

Whether these beds are basal Ordovician or Upper Cambrian is debatable. Although the faunal evidence is meager and not altogether conclusive, the very typical Upper Cambrian trilobites had seemingly disappeared prior to the deposition of the Ritchie limestone. On the other hand, the more pronounced stratigraphic break is above the Ritchie. In lieu of more conclusive faunal evidence, it must be left uncertain whether the Ritchie limestone in this area is a basal Ordovician or a very late Upper Cambrian formation; perhaps the uncertainty will stimulate further research.

Hanson is of the opinion that the Ritchie limestone may represent an offshore facies of a portion of the sandier Hoyt, having been deposited on the seaward side of the *Cryptozoon*

reefs while the typical Hoyt was restricted to the area between the reefs and the Adirondack land mass. The difference in biota on either side of the reefs is not surprising, for the same phenomenon occurs in modern seas.

After Hanson left the field, Fisher restudied a large area to the west of Rock City Falls. The persistent, white, relatively pure, sandstone referred to by Miller (1911, p. 29) was found useful in mapping. Examination of the sections including this sandstone disclosed that an unconformity of some magnitude occurred at its base. This unconformity manifests itself as such when studied on a regional scale, but at any single outcrop only a break of apparently diastemic value is visible. The prominent sandstone is interpreted as the base of the Ordovician in the area and the name Mosherville sandstone is proposed for it. A road cut 2 miles southwest of the village of Galway is designated as the type locality. This section is reproduced under a subsequent heading. Ranging from 4 to 7 feet in thickness, the Mosherville sandstone is typically a massive bed of white orthoquartzite, although in places a porous crossbedded brown iron-stained sandstone is exposed. This basal Ordovician unit is favorably exposed in field exposures half a mile south of Mosherville, a quarter of a mile southwest of Parks Mills (no longer designated on the most recent topographic map), in road cuts 2 miles southwest and $2\frac{3}{4}$ miles northwest of Galway, half a mile north-northeast of West Galway, and in the railroad cut half a mile north-northeast of South Greenfield. The extreme lithologic similarity to the older Potsdam has undoubtedly been a source of confusion in the past. Prosser (1900) mapped a small patch of Potsdam three-quarters of a mile south of the northern boundary of the Amsterdam quadrangle along the western upthrown side of the Hoffmans fault. In reality this is the Mosherville sandstone, and its stratigraphic position with respect to the known sections in the Mohawk Valley is clear for it is the basal member of the cherty arenaceous dolomite with a Lower Ordovician fauna (Gailor dolomite). As shown on the diagrammatic cross section (fig. 3), the Mosherville sandstone truncates the bevelled beds of first the Hoyt limestone and then the Galway formation in a westwardly direction. Thus the Hoyt limestone does not pass into dolomite in the Broadalbin quadrangle as Miller (1911, p. 29) had supposed.

Discovery of *Helicotoma* (?) *uniangulata* in cherty arenaceous dolomite above the Mosherville sandstone in the northern portion of the Amsterdam quadrangle (plate 1, fig.9) and *Ophileta* and *Lytopira* (*Ecculiomphalus* of some authors) in gray sandy dolomite 2 miles west of Saratoga Springs as well as cross sections of *Ophileta* and *Ectenoceras* in gray dolomite in the Gailor quarry at the northern edge of Saratoga Springs disproves the assignment of these layers to the Upper Cambrian. Various workers in the past have regarded the dolomites in this region as Little Falls (Ulrich and Cushing, 1910; Miller, 1911; Cushing and Ruedemann, 1914; Colony, 1930; Wheeler, 1942). Since they occur stratigraphically higher than the Hoyt limestone, it is understandable that the Hoyt was regarded as lying beneath the Little Falls dolomite.

Tracing of the Little Falls dolomite from its type locality at Little Falls, N. Y., eastward into the Saratoga region shows that it is absent there as such, but that its correlatives are facies equivalents, namely, the Potsdam sandstone, Galway formation, and perhaps even a portion of the Hoyt limestone. The Little Falls dolomite (restricted) thus represents an offshore more carbonate phase of the aforementioned formations, and indeed lateral gradation is readily apparent in many places. The absence of these other formations within the Mohawk Valley further corroborates this interpretation; wherever exposed, the Little Falls rests directly on the Precambrian.

As *Ophileta*, *Helicotoma* (?) *uniangulata*, and *Ectenoceras* are exclusive Canadian index fossils, the latter two indicative of the Lower Canadian, the age of the cherty dolomite above the Mosherville sandstone is established as lowermost Ordovician. The name Little Falls dolomite for these beds is unquestionably in error, and the name Skene dolomite (Wheeler, 1942, p. 522) is similarly not applicable because it was defined as Upper Cambrian. The senior author proposes the name Gailor dolomite for these beds from the Gailor quarry which is situated at the northern edge of the city of Saratoga Springs just west of U. S. Highway 9. While no complete section is available, this quarry is designated as the type locality, for it is likely to prove an excellent exposure for years to come. A section at this quarry is given under the next heading. The Gailor dolomite varies from about 80 feet in

the northern portion of the Amsterdam quadrangle to about 150 feet in the Saratoga region. Four miles southwest and $1\frac{1}{2}$ miles northeast of Galway, and $1\frac{1}{4}$ miles west of the Petrified Sea Gardens, the formation is capped by a massive 6-foot gray chert bed which locally contains *Cryptozoon*.

In the Saratoga region proper, rocks of Tribes Hill age are lacking, due to offlap, removal by post-Canadian erosion, or by a facies change into the Gailor dolomite. A thin representation of Tribes Hill sandy limestone can be seen a few miles to the southwest on the Amsterdam and Broadalbin quadrangles where it can be observed overlying the Gailor dolomite.

At Rock City Falls one foot of Lowville limestone lies above 12 feet of cherty Lower Ordovician dolomite and beneath the Amsterdam limestone. Prosser (1900, p. 476) noted this layer as the "Birdseye" (Lowville) limestone but later workers failed to recognize it as such.

Mapping of the Middle Ordovician limestones along the southern margin of the Adirondacks has been perplexing because of the insufficient knowledge concerning the boundaries of the formations and, in some cases, lack of proper definition of the formations themselves. Cushing and Ruedemann (1914) mapped 40 feet of Amsterdam limestone at Rock City Falls when actually only 3 feet exist there, the remainder of the section being Trenton with Rockland (?), Hull, and Sherman Fall representatives. The Amsterdam is sharply separated from the Trenton here by a marked disconformity. *Bathyurus spiniger*, a diagnostic Rockland species, according to Kay (1937, p. 300), was collected in the layers tentatively referred to as Rockland, although further investigation must be carried out to prove or disprove the Rockland designation. *Cryptolithus tessalatus*, the zone fossil of the Sherman Fall (Shoreham limestone) was found on the downthrown side of the Rock City Fault and also 43 feet higher on the upthrown western side.

Of special interest from a structural standpoint is a superb exposure of a fault zone in the Gailor quarry at the northern edge of Saratoga Springs (plate 2, fig. 1). The fault zone reaches a maximum width of 9 feet and is exposed for 26 feet vertically. The upper portion shows a markedly U-shaped horse consisting of thin beds of Amsterdam and Trenton

limestones. The lower part is a badly crushed mylonite zone with some boulders of dolomite up to 4 feet in diameter. No limestone was observed within this lower portion. The complexity of normal faulting is well demonstrated here, for the single fault displayed on the south wall of the quarry branches into several smaller fractures in the center of the quarry, again coalescing into one large fault zone in the northern wall of the quarry. It would seem that the bulk of the movement took place after the deposition of the dolomite with renewed faulting during Trenton time. The limestone beds of the "U" show slight flowage indicating that perhaps faulting was penecontemporaneous with deposition. An alternate theory is that virtually all of the movement occurred prior to the deposition of the Amsterdam limestone and that it and the Trenton limestone fill a depression eroded in the relatively non-resistant mylonite zone. The exposure in the northern quarry wall supports this idea in that the bedding planes of the Amsterdam limestone are horizontal and do not exhibit the "U" shape of exposure as in the southern quarry wall. The light gray crystalline dolomite constituting the fault blocks is heavily mineralized. Gray and black chert are common in the upper beds and some agatized chert was found locally. Exquisitely preserved quartz crystals, though confined to the lower beds of the quarry, are profusely developed where the main fault branches. Calcite and dolomite crystals are very common, the crystallization of both preceding that of the quartz. Some pyrite and a black carbonaceous material were found in the brecciated fractures. Mud cracks filled with calcite were found indicating a shallow water origin for the strata.

A new geologic map is presented and that of Cushing and Ruedemann (1914) is also inserted for comparison (figs. 2A and B). As will be noted the courses of some of the faults on the new map diverge markedly from the courses on the original map. The Rock City Falls fault is shown to be an extension of the McGregor fault, whose course runs *south* of the Petrified Sea Gardens rather than a quarter mile north of it as the former map indicates. Several other alterations in the areal mapping may be read from the maps.

DETAILED STRATIGRAPHIC SECTIONS

Composite of two railroad cuts and a road cut along New York State Highway 9-K, 3 miles west-northwest of Saratoga Springs.

Galway formation (type locality):

- 1'8" Gray sandy dolomite with small oolites.
- 3'4" Gray-black sandy dolomite, top 6" oolitic.
- 11" Mud cracked dolomite sandstone. *Lingula acuminata*.
- 8" Coarse conglomerate with oolitic matrix.
- 1' Oolitic dolomite.
- 6" Dolomitic sandstone with trilobite fragments.
- 1' Massive sandy crystalline dolomite; *Cryptozoon* cf. *undulatum* in lower portion.
- 1'10" Medium bedded crystalline dolomite; *Lingula* and *Plethometopus* fragments.
- 3' Massive brownish-white coarse grained sandstone.
- 6" Gray dolomite. *Lingula*.
- 3' Gray sandy dolomite grading into dolomitic sandstone, slightly cross-bedded.
- 25' Concealed.
- 1'8" Gray dolomite.
- 3'2" Massive white coarse grained sandstone with calcareous cement.
- 4" Dark gray medium grained limestone.
- 2'4" Blue-black dolomite with many calcite pockets frequently containing quartz crystals.
- 2' White cross-bedded sandstone, weathers brownish due to iron.
- 1' Thin bedded sandy limestone, *Elvinia ruedemanni*, *Berkeia saratogensis* and *Camaraspis* sp. Irregular base locally marked by 0-2" of shale.
- 2'9" Massive white sandstone.
- 5" Calcareous sandstone and sandy limestone. *Elvinia ruedemanni* and *Berkeia saratogensis*.
- 4'2" Gray sandy dolomite.

Composite section of exposures just south of the Petrified Sea Gardens in field to the east and old quarry to west of road.

Gailor dolomite:

30' Spotty exposures of gray-blue sandy dolomite on hill.

Mosherville sandstone:

2-7' Cobble conglomerate with sand matrix. Cobbles consist of dolomite and calcilutite. Grades laterally into coarse sandstone.

Ritchie limestone (type locality):

43' Massive very thick bedded ash-white weathering gray-blue calcilutite only slightly dolomitized. Contains black chert nodules and *Rhachopea* (?). Disconformable base.

Hoyt limestone:

8' Non-cherty dark gray dolomite.

Section along south side of road, 2 miles southwest of Galway.

Gailor dolomite:

4'9" Medium bedded gray-brown sandy dolomite.

Mosherville sandstone (type locality):

6' Massive bed of white slightly cross-bedded orthoquartzite stained brown in places by iron oxide.

Galway formation:

1'8" Gray-black dolomite, oolitic; thin *Cryptozoon* in places.

1'3" Gray-black dolomite.

6'6" Alternating beds of thin blue-gray laminated dolomitic sandstone and shale. Contains *Lingula*.

8' Concealed.

6'6" Medium bedded dark blue crystalline dolomite.

Section in Gailor quarry at the northern edge of the city of Saratoga Springs, 1/8 mile west of U. S. Highway 9.

Gailor dolomite (type locality):

10'6" Massive, thick bedded, light gray crystalline dolomite with much black to dark gray chert near top. Chert nodules become less abundant the further the distance from the top. Some calcite pockets and a minor amount of pyrite.

10' Medium grained light gray crystalline dolomite with a greater amount of detrital quartz and feldspar than above beds. Some calcite pockets and some black chert.

- 5-10" Thin bedded laminated gray-black dolomite with detrital quartz and more carbonaceous material than other beds. Contains mud cracks and calcite.
- 12'6" More compact light to dark gray crystalline dolomite with abundant vugs lined with dolomite, calcite, and quartz crystals. Contains no chert. Some shale fillings. A slight break in sedimentation may occur above this zone. Cross sections of *Ophileta* and *Ectenoceras* found here. Petroliferous odor when freshly fractured.

Section at Rock City Falls in abandoned quarry and along Kayaderosseras Creek.

Trenton limestone:

- 2'9" Thin bedded fine grained blue-black limestone. *Cryptolithus tessalatus* common.
- 8" Shale, somewhat calcareous.
- 2' Medium bedded blocky blue-gray limestone. Weathers ash-white.
- 2'9" Thin bedded gray-black limestone with shale intercalations. Fossiliferous; *Cryptolithus* common. Base of Sherman Fall.
- 9" A single bed of coarse gray exceedingly fossiliferous limestone. Top stratum of Hull age.
- 1' Irregular bedded argillaceous limestone.
- 4'9" Medium gray crystalline fossiliferous limestone.
- 4' Thin bedded blue-gray fossiliferous limestone. Weathers light gray. Solution fillings at base. Minor break here.
- 2'11" Thick bedded compact fine grained blue-black limestone.
- 2-6" Coarse gray limestone with 1" of shale at base. Basal bed of Hull age (?).
- 5" Blocky reworked lumpy blue-black fine grained limestone. *Streptelasma*. Top of Rockland (?).
- 6' Medium to thin bedded white weathering fine grained blue-black limestone. *Bathyurus spiniger*. Rough fracturing. Lumpy and very conglomeratic near base. Marked disconformity at base.

Amsterdam limestone:

- 3' Thick bedded white weathering black limestone. Rough fracturing.

Lowville limestone:

1' White weathering gray calcilitite. Absent in places.

Gailor dolomite:

12' Cherty blue-gray medium to fine grained dolomite.

SUMMARY

The most notable revisions, aside from changes in the geologic map, are:

- (1) Alteration of the stratigraphic succession and thicknesses of the formations to agree more closely with the new field evidence.
- (2) Re-introduction of the name Galway for the strata heretofore referred to as "Theresa," and the raising of its upper boundary.
- (3) Proposal of the name Ritchie limestone for the massive white weathering gray-blue calcilitite of basal Ordovician or very late Upper Cambrian age.
- (4) Re-location of the Cambrian-Ordovician boundary over most of the area.
- (5) Evidence for Lower Ordovician strata within the Saratoga quadrangle, namely the Gailor dolomite with its basal member the Mosherville sandstone.
- (6) Restriction of the Amsterdam limestone to 3 feet or less within this region rather than some 50 feet as indicated in the past.

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