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Geology of Southern Connecticut, East-West Transect

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Trip B-1: Geology of Southern Connecticut, East-West Transect.
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This trip crosses the following quadrangles, published quadrangle maps of which are listed below:

	Bedrock Geology	Surficial Geology
New Haven (Stops 1 and 4)		CG&NHS QR 18
(Woodmont)		CG&NHS QR18
Branford (Stop 2)		CG&NHS QR 14
(Wallingford; route ticks southwest corner)		CG&NHS QR 10
Mount Carmel (Stops 3 and 5)	USGS GQ-199	CG&NHS QR 12
Naugatuck (Stop 6)	CG&NHS QR 9	CG&NHS QR 35
Waterbury (Stop 7)	CG&NHS QR 22	
Thomaston (Stops 8 and 9)		USGS GQ-984

Stratigraphic Column: Newark group in Hartford basin (Central Lowland).

Lower Jurassic	Equivalent dikes, according to Philpotts and Martello, ms.
Portland arkose	
"Meriden formation" of Krynine (1950)	
Hampden basalt (3rd flow)	Bridgeport-Pelham dike
East Berlin formation	
Holyoke basalt (2nd flow)	Buttress-Ware dike
Shuttle Meadow formation	
Talcott basalt (1st flow)	Fair Haven and Higganum dikes
Upper Triassic	
New Haven arkose	

Stratigraphic Column for Rock Units Mentioned in Western Highlands (all age assignments are uncertain)

Hartland belt	Orange-Milford belt
	Silurian and Lower Devonian
Southington Mountain schist	
The Straits schist	Wepawaug schist
	(unconformity)
	Ordovician
Collinsville formation (partly equivalent to Prospect or Harrison gneiss)	Maltby Lakes chlorite schist
	(fault zone)
	Cambrian
Waterbury gneiss (composite unit)	

DON'T FORGET TO SET YOUR ODOMETER TO 0.0 BEFORE STARTING OUT!

(The mileage for this itinerary was measured with a car whose odometer is about 1% fast.)

Mileage

0.0 Kline Geology Laboratory (town and city of New Haven, New Haven quadrangle).

0.2 Exit from Kline parking lot; traffic light. Go straight (east) on Humphrey Street.

0.4 Next traffic light; turn right (south) on Orange Street.

0.7 Next traffic light; turn left (east) onto ramp, then take right fork onto I-91 South.

0.9 Once on I-91, it is necessary to cross at least two lanes of traffic to the left in 0.3 mile in order to take the left ramp for I-95 East.

1.6 On I-95, one has a mile to cross back to the right lane before Exit 50 (lane marked exit only). On the way we cross the Mill and Quinnipiac Rivers as they join at the head of New Haven Harbor.

2.7 Take Exit 50. Red New Haven arkose (Triassic) is visible to the right from the ramp.

3.0 Traffic light; turn right (south) on Woodward Avenue.

3.9 Low outcrop of traprock on right, part of a dike connected with the Forbes Bluff sill (see beyond), intrusive into the New Haven arkose.

4.5 Optional stop; second parking lot in Fort Hale Park. The hill ahead is held up by part of a saucer-shaped sill of fine-grained gabbro, rather well exposed in Forbes Bluff along the shore.

4.7 "T" intersection; turn right (south) on Townsend Avenue.

4.9 Route returns to shore of Morris Cove at southeast end of Forbes Bluff, visible to right. Far shore of Morris Cove is underlain by Light House (granite) gneiss beyond Eastern Border Fault of Mesozoic Connecticut basin, here running almost east-west close to that shore.

5.5 Traffic light; turn right (southwest) on Light House Road. We are here practically over the Eastern Border Fault, and outcrops appear along the road somewhat farther on.

6.1 Enter Light House Point Park, keeping right. Granite in road cuts.

6.3 Parking lot for Light House Point. Busses park at Pavilion. (The Lighthouse itself is on the Woodmont quadrangle.)

STOP 1:

Outcrops on the shore are the Light House gneiss, here somewhat broken and shattered due to the near proximity of the Eastern Border Fault. Standing on the shore and looking northwest, one sees Morris Cove in the fore-ground to the right. The Eastern Border Fault passes close to the southeastern side of the cove. The Fault then passes southwesterly beneath New Haven Harbor; the gneiss to the south forms a buried escarpment that has been lowered by blasting to provide shipping lanes. Along the fault is a deep valley, now filled with glacial outwash sediments as much as 600 feet deep. Indeed, all of downtown New Haven is built on glacial outwash sands in which there are local lenses rich in organic matter.

On the northern side of Morris Cove stands Forbes Bluff, a small sill of fine-grained gabbro. Beyond the Bluff, East Rock and West Rock, both sills, are visible. The two sills dip gently to the east, having the prevailing dip of the Triassic sediments they intrude. On the far horizon, metamorphic rocks of the Western Highlands can be seen emerging from beneath the Triassic unconformity. The unconformity can be seen in a number of places and will be observed at Stop 4.

Return to traffic light (5.5). (At about 6.95, cars can turn right on Cove Street and cut off corner, then, in less than 0.1 mi., turn right again on South End Road and pick up itinerary at 7.25.)

7.1 Traffic light (=5.5). Turn right on Townsend Avenue or South End Road.

7.6 Enter town of East Haven and then Woodmont quadrangle. Several outcrops of Light House gneiss nearby.

7.8 Stop sign; turn left (east) on Silver Sands Drive.

8.4 Turn left (northeast) on Silver Sands Road, soon re-entering New Haven quadrangle.

9.2 Enter Branford quadrangle. Gneiss in quarry to left (northwest) of road is badly shattered, being close to border fault.

9.3 Stop sign; continue straight (east). We are here following a low ridge over the Light House gneiss just south of the border fault, which lies at the north foot of the ridge.

9.5 Stop sign; continue ahead, but soon bear left.

9.8 Stop sign; turn left (east) on Route 142. For the next two miles, the route runs through large outcrops of gneiss or granite.

10.4 Optional stop to see Light House gneiss.

10.5 Cross East River and enter town of Branford.

10.9-11.1 Road follows shore of Pages Cove; gneiss crops out on headlands and islands.

12.6 Traffic light at U.S. 1; we have returned to the border fault. Turn right (east) under RR overpass. Beyond overpass road turns northeast and starts to follow border fault. Prepare to stop.

12.8 **STOP 2:**

U.S. 1 here follows the Eastern Border Fault. To the west, a fragment of the Talcott Flow, with its distinctive pillow structures, lies in the hanging wall. Across Route 1, east of the fault, the Branford (granite) gneiss is extensively fractured, sheared and hydrothermally altered. Alteration extends for several hundred meters from the fault; feldspars form clays and epidotes, ferromagnesian minerals form serpentine and chlorite, and well formed quartz crystals are common.

Continue northeast on U.S. 1, which soon diverges eastward from border fault into gneiss (Branford gneiss cutting metasediments of Waterford group). Pass traffic light and blinker.

13.4 Quarry on right shows sheared Branford gneiss, here including some schist, intruded by dikes of granite pegmatite and granite, both probably marginal to the Stony Creek granite.

13.5 Second traffic light; turn left (north) on Cedar Street.

13.6 During construction of apartment complex to left, the border fault zone was uncovered; the dip was nearly vertical, in contast to its 55' dip as recorded north of Lake Quonnipaug in Guilford and also in Manchester. In both those places, the fault trends nearly north-south, whereas here it trends northeast; strike-slip movement may be more important here.

13.7 Optional stop, at or just beyond underpass of I-95. Cedar Street here is exactly on the border fault. Entrance ramps to east, especially north of I-95, show highly sheared and partly silicified gneiss (Branford gneiss). Cuts on I-95 at end of entrance ramp to west show maroon sediments.

13.75 Turn left onto entrance ramp onto I-95 West.

14.0 Outcrops of basalt; same slice as at Stop 2. Beyond, road enters basin of Portland arkose dipping generally toward the border fault and framed by the three lava flows.

15.7 Tollbooths on Conn. Turnpike (I-95). The Hampden (3rd) flow, dipping east, passes under the eastern part of the tollbooth plaza without cropping out, but it is exposed in the hills to the north.

16.1 Lake Saltonstall, in valley over East Berlin formation. Enter town of East Haven. The big cut just beyond on the right (north) is in the Holyoke (2nd) flow, dipping east, at the south end of Saltonstall Ridge, but the highway and railroad pass along a cross-fault zone that produces a left offset. The little ridge on the south, east of the small bridge over the highway, is the

offset portion of the Holyoke flow; moreover, the shape of Lake Saltonstall at this point reflects the offset (see Figure 1). During the construction of I-95, John Sanders and students in the Yale Field Geology course mapped the roadbed and vicinity and showed that the fault zone is composite, being made of several nearly vertical, east-west faults, not all with left offset. (See also description of Stop 11, Trip C-1.)

16.6 Cuts in Talcott (1st) flow, showing pillows, vesicular basalt, and a dike (feeder?). (See description of optional stop in Trip C-1, mileage 76.8.)

16.8 Enter New Haven quadrangle.

17.5 Enter town (city) of New Haven.

17.8 Poor outcrops of New Haven arkose on right (where not hidden by concrete walls). Parallel road to north (old U.S. 1) exposes the same, cut by dikes of the Fair Haven swarm.

19.2 Take exit 48 (right exit) onto I-91; follow it to Exit 10.

20.1 East Rock sill is prominent ahead; we pass just right of it.

21.5 Cross Quinnipiac River. Hills ahead are underlain by dikes of Fair Haven swarm. Big cut beyond apartment complex shows two dikes intersecting at right angles, and much baked arkose.

22.7 Enter town of North Haven, then Branford quadrangle.

24.0 After Exit 9, Mt. Carmel or the Sleeping Giant is visible straight ahead; it is a large stock of gabbro.

25.3 Take Exit 10 onto Route 40. As the road bends left and crosses I-91, the Sleeping Giant is evident off to the right. For a short distance we are on the Wallingford quadrangle but then enter the Mount Carmel quadrangle.

27.6 Stop at sign marking Hamden town line.

STOP 3:

A sequence of easterly dipping, Triassic flood-plain sediments. Each unit is graded and each is presumed to represent a single flood event. Pebbles in the graded units can be identified with units to the east of the Eastern Border Fault, here more than 10 kilometers away. The green color at the top of each graded unit may be due to a local accumulation of very fine-grained organic matter acting as a reducing agent.

Continue northwest on Route 40.

28.4 Traffic light at intersection with Route 10 (Whitney Ave.). Turn left (south).

29.8 Village of Centerville. Route 10 turns right, but we continue south on Whitney Avenue.

30.1 Entrance to Wilbur Cross Parkway, not available for busses.

30.4 Enter New Haven quadrangle.

31.9 Bridge over Whitney Lake (on Mill River).

33.0 Lake Whitney on left (east). Whitney Peak at north end of East Rock sill across lake; Mill Rock (dike) exposed on right at 33.1. The dam at Lake Whitney is on the site of the original dam for water power for the works of Eli Whitney, the inventor of standardized parts and the cotton gin. An industrial museum has been established at the site, the location of his gun factory. The dam was located where Mill River had a natural waterfall over the Mill Rock dike, which connects the East Rock sill, visible to the left (east), through Mill Rock, to the right (west), and Pine Rock to the south end of the West Rock sill in West Rock. The dike is exposed on the right (west) side of Whitney Avenue.

Stay in right lane and watch for traffic light.

33.2 Turn right (west) on Armory Street, following south side of Mill Rock.

33.6 "T" intersection; turn left (south) on Prospect Street.

33.9 Turn right (west) on Goodrich Street; continue past two stop signs (Winchester and Newhall Aves.) and one traffic light (Shelton Ave.).

34.7 Abandoned railway track and second traffic light. Turn right (north) on Dixwell Avenue.

34.9 Traffic light; turn left (west) on Arch Street.

35.2 Traffic light; turn left (southwest) on Fitch Street.

35.4 Enter town (city) of New Haven. We are driving by Southern Connecticut State University.

35.7 Turn right (northwest) on Wintergreen Avenue. Pine Rock is visible on right. It is formed by a westward continuation of the Mill Rock dike, but quarrying excavations over the years have shown it to be a complex of small intrusions. To the left is West Rock, the south end of the major West Rock sill, which dips east with the enclosing strata of the New Haven arkose.

36.1 The road cut at the west tip of Pine Rock exposes the rounded top

of the dike; the columnar joints form a fan. The large area beyond on the right was a large gravel pit in glacial outwash forming a delta that was built north by part of West River, flowing eastward and northward around the end of West Rock.

36.35 Bear left, then turn sharp left (36.4) onto Springside Avenue; road goes south along the east foot of the dip slope of West Rock.

36.9 West Rock terminates just to the west; the termination has been made more abrupt by quarrying in the last century. The east corner of the quarry is worth visiting (from here); one sees the top of the sill and overlying baked arkose, both cut by the same columnar joints. The upper surface of the West Rock sill north of here is quite irregular; apparently small dikes projected from it in the direction of Pine Rock, but the actual source of Pine Rock must have been farther down dip, still in the subsurface.

37.2 Traffic light; turn right (west) on Blake Avenue.

37.5 First of two traffic lights; turn right (northwest) on Valley Road. Impressive view of south face of West Rock. The bottom of the sill is not parallel to bedding here but climbs southward toward the sill's termination (as can be seen clearly when leaves are off the trees).

37.9 New bridge over West River. In 1981, the West River flooded following torrential local rains. The bridge was washed away and all houses in the immediate area were flooded. A kilometer downstream, where the West River crosses Whalley Avenue, factories and stores were flooded, and the road surface was uprooted when several meters of water flowed across it.

38.3 Traffic light; turn left (southwest) on East Ramsdell Street.

38.5 Traffic light; turn right (northwest) on Whalley Avenue.

38.7 Take left fork (Route 63, not 69).

39.0 Pass under Wilbur Cross Parkway and immediately turn left on first entrance road for Amity Shopping Center; proceed 0.15 mi. past south end of shops to cliff face; turn right and drive behind shops as far as possible.

39.3 **STOP 4:**

This is a classic outcrop. The metamorphic rocks of the Western Highlands lie unconformably below the Triassic sediments of the Connecticut Graben. The basement rocks belong to the Maltby Lakes formation (formerly known as the Milford Chlorite Schist), a unit believed to be largely metavolcanic. The angular unconformity on which the coarse

Triassic arkosic grits and conglomerates lie, dips gently toward the east. Across the valley to the east, the West Rock Sill (gabbro) is visible.

The nearly bare rock surface above the stop is approximately the unconformable surface, exhumed by erosion by Pleistocene time, glacially smoothed and covered by till, then exhumed again by man. On the far side of the surface, the Maltby Lakes formation is cut by a dike of fine-grained gabbro, the Buttress dike. The dike, which continues for many kilometers both north and south, can be seen to cut the West Rock sill about 250 meters north of the gap where the Wilbur Cross Parkway tunnels through the sill; it forms a prominent spur, called The Buttress, on the west or scarp face of West Rock. (The gap is not eroded over a fault but over a zone of intense jointing that caused a great deal of trouble during the building of the tunnel.)

Return to Route 63 and turn left (northwest) (39.6). Enter town of Woodbridge.

39.8 Traffic light; turn right (east) on Lucy Street.

40.0 Traffic light; turn left (north) on Litchfield Pike (Route 69). We now follow valley of West River, between scarp face of West Rock on the right, and exhumed pre-Triassic erosion surface on left.

42.1 Dam of Lake Dawson on right. During excavation for this dam, the unconformity of the Triassic on the older rocks (here the Wepauwaug schist) was well exposed, dipping east.

42.6 Enter Mount Carmel quadrangle.

42.7 Cement kiln on left at junction of Dillon Road. Continue straight on Route 69, but we will return here. Route 69 now starts to climb up left side of valley and to cut into Wepawaug schist (with layers of dirty carbonate rock).

43.3 Stop just short of end of guard rail, opposite south end of large roadcut on left in Wepawaug schist, here a phyllite.

STOP 5:

The Wepawaug schist here is at chlorite grade and shows three principal rock types:

1) muscovite-chlorite-quartz-plagioclase phyllite with more than 40% mica;

2) quartz-plagioclase-muscovite-chlorite phyllite with less than 20% mica; and

3) calcite-dolomite-muscovite-quartz brown-weathering limestone.

It also includes lenses of "Woodbridge granite", made of plagioclase, quartz, muscovite, and minor K-feldspar, probably felsic tuff. According to Dieterich (1968a, b), the dominant foliation is closely spaced F2 axial-plane crenulation cleavage; minor F_2 folds are visible in the northern part of the exposure. Streak lineations at an angle to the F_2 axes are F_1 lineations parallel to F_1 fold axes (difficult to see in the natural outcrop but visible in thin-section). F_4 kink-bands are prominent. F_3 has not been seen here.

Make U-turn and return to corner of Dillon Road.

43.9 Corner of Dillon Road (= 42.3); turn right in front of cement kiln. The "limestone" burned in the kiln came from a quarry on the hill behind, cut in a large lense of the very impure carbonate rock in the Wepawaug schist, like that seen at Stop 5 (rock type 3).

In this area Fritts (GQ-199) mapped many small bodies of "Woodbridge granite"; these have turned out to be lenses of felsic metavolcanics (Jean Bahr; unpublished senior essay at Yale). Unfortunately no good exposures are accessible to a large group.

44.4 Enter New Haven quadrangle.

45.3 "T" intersection with Route 63 (Amity Road); turn right (north).

45.4 Road ticks southwest corner of Mount Carmel quadrangle and enters Naugatuck quadrangle.

45.7 Intersection of Routes 63 and 67; turn left (west) on 67.

46.1 Under thick glacial till (note nice drumlin to north), we cross East Derby fault, from relatively lower grade Wepawaug schist into relatively higher grade but probably correlative The Straits schist; the latter was called Cooks Pond schist by Crowley (QR 24) and Derby Hill schist by Fritts (GQ-426 and 199).

46.6 Ridge ahead marks edge of Prospect (Harrison) gneiss; along the border is the distinctive Pumpkin Ground porphyritic member, which we will not see here; we will see comparable rocks ("horse-tooth gneiss") at Stop 6. Road follows Bladens River through ridge.

48.4 Enter town of Seymour. We are here crossing the Bridgeport synform, a true syncline for Crowley and Hall, an overturned anticline for Dieterich and Rodgers. Beyond, to right, a large gravel pit in stratified drift.

49.6 Entrance ramp for Route 8 North. Turn right (north) and join Route 8. The outcrops at the right, at the end of and beyond the ramp, are fairly typical Prospect gneiss, here on the west limb of the Bridgeport synform, though only a few layers show the coarse "horse-tooth" K-feldspars. Much fancy folding of layers and veins.

50.3 We now enter the "jelly roll", first worked out by Dieterich (1968a, b). See Figure 1. A deep isoclinal, compound, probably recumbent and west-vergent syncline of The Straits schist forms the jelly layer in cake made of older gneisses (Collinsville and Taine Mountain formations), probably equivalent, in part at least, to Prospect (Harrison) gneiss. The syncline was then rolled up by two later east-vergent fold phases, and the roll itself was then bent over the rising Waterbury dome (north of us) as if over someone's knee. Erosion now gives us two oblique-sections of the jelly roll, north and south of the dome; we are here in the southern oblique-section. The Straits schist is a resistant rock and makes ridges. At and north of Seymour village the upper layer of jelly is crossed three times in a mile by the sinuous Naugatuck River, the two southern crossings (behind us on the left) marked by distinct riffles which were exploited for water power - hence the village. The lower (west) contact of this layer used to be well exposed along Route 8 at 50.3, where Rosemary Vidale studied in detail the reaction between calcite-bearing layers and aluminous The Straits Schist, matching the natural occurrences by experimental work, but the outcrop was entirely destroyed in the most recent relocation of Route 8. The outcrop is described by Vidale in Burger and Hewitt (1968, Trip D-1, p. 15-18; see also Vidale, 1969). The cliff high on the south end of the Hill ahead to the right (Rock Rimmon) shows The Straits schist and the same contact. The road cuts beginning at the Beacon Falls town line (50.5) are in the underlying Collinsville gneiss between the upper and middle layers of jelly, the latter cropping out on the lower slopes of the hills to the left across the river.

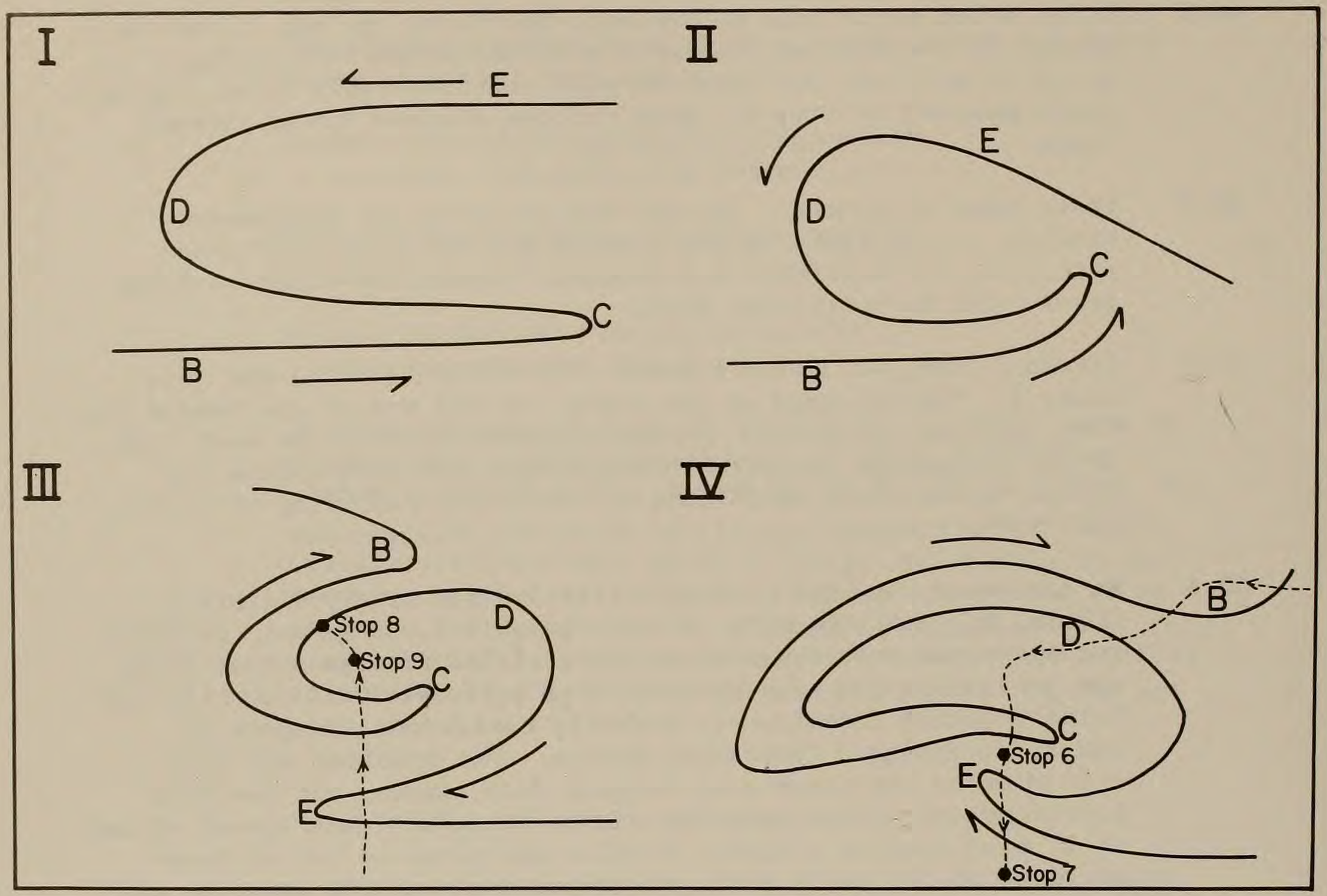

Figure 1. Conceptual scheme to produce the jelly-roll structure, inspired by but somewhat simplified from cross-sections in Dieterich (1968b, Figs. 4 and 5).

I. F_1 - west-vergent recumbent folding; contact from C to D becomes inverted.

II. Continued west vergence; hooking of C.

III. F_2 - east-vergent folding; contact from B to E is steepened and in large part inverted and then flattened, producing present form of northern oblique-section of the roll.

IV. F_3 - anticline B is carried on eastward and overturned to become Bridgeport synform, east of southern oblique-section of roll. Trip route is very generalized.

52.7-52.9 Large outcrops on both sides of Route 8 within bend of the Naugatuck River west of Beacon Falls village. The middle layer of jelly, The Straits schist, forms a separate outcrop on the left (west) side of the road (at 52.5) south of the main outcrops and can be traced to outcrops on old Route 8 in the village and about a mile farther east, where it ends, wrapped around by "cake", itself wrapped around by jelly connecting the upper layer (50.3) with the lower layer, which forms the prominent gorge of the Naugatuck River just ahead of us (53.1 to 54.8). The large outcrops here are in the layer of cake between the middle and lower layers of jelly. Stop near north end of outcrop, short of end of guard rail.

STOP 6

These new outcrops are some of the finest known of the "horse-tooth" gneiss, filled with large Carlsbad twins of K-feldspar. Carr mapped them as Prospect gneiss, and they certainly fit its Pumpkin Ground member; here, however, we now assign them to the Collinsville formation. As both units are now interpreted as largely felsic metavolcanics of Ordovician age, the difference is not important.

Continue north on Route 8.

53.1-54.8 Gorge of Naugatuck River thrcugh the type belt of The Straits schist, here the lower layer of jelly in the jelly roll. The Straits is a narrow pass in this ridge 3 miles to the east, where Route 63 passes through on its way from New Haven to Naugatuck. The rock is coarse two-mica schist, almost always slightly graphitic and highly aluminous (garnet, staurolite, usually kyanite), full of pegmatite bodies. The original rock was probably an euxinic black shale.

54.9 Enter town (borough) of Naugatuck. Collinsville formation beneath The Straits schist is exposed in low cuts on the railroad across the river, but the locality is not easy to reach. We now approach the Waterbury dome, which Dietsch's work (see trip A-1 in this guidebook) shows is even more complex than we feared. First we pass the bordering rocks (the lowest layer of cake below the lowest jelly), not exposed at all along our route, and then, at about 57.2, we enter the "core" rocks in the eastern of the three antiforms into which Dietsch has dissolved the dome.

57.3 Enter Waterbury quadrangle.

58.0 Take Exit 29 onto Main Street north.

58.3 Traffic light; turn right and proceed up hill past outcrops. The busses will let us out at the top of the outcrops, then turn around and pick us up at the bottom, or in the parking lot across Main Street.

58.5 **STOP 7:**

Typical outcrop of some of the rock types in the Waterbury gneiss and the surrounding units, including ultramafic pods, in an intensely sliced up zone cutting across the eastern antiform.

Return to traffic light; turn left on Main Street.

58.7 Immediately take entrance ramp to right onto Route 8 North.

60.0 Rejoin Route 8 and enter town (city) of Waterbury. Several large outcrops on left are in "core" rocks of Waterbury dome. Hill across river in the center of the city, marked by large cross, is a body of orthogneiss (cut by intrusions of several ages) that appears to form an "inner core" within the Waterbury gneiss.

61.6 Enter complex of roads where Route 8 crosses I-84. Stay on Route 8 north, avoiding two right forks and taking third.

63.7 About here we leave the "core" rocks and re-enter the cover rocks, the lowest layer of cake.

64.3 Exit 36; stay on Route 8. Road now starts to climb hill on west side of river. Outcrops on second prominent spur across river (northeast) display contact between Collinsville gneiss and The Straits schist, the latter being part of lowest layer of jelly. As shown by Gates and Martin (QR 22), the jelly syncline is here doubled back on itself across a west-plunging antiform, over which the lowest layer of cake is folded back into the main jelly roll. We are entering the northern oblique-section of the roll.

64.7 Enter town of Watertown.

65.5-65.9 Across crest of hill, road passes through the antiform of The Straits schist. White patch near north end of outcrop left (west) of road, close to end of southbound entrance ramp, is kaolin produced by preglacial weathering of a pegmatite body and preserved from glacial erosion. Beyond crest of hill, road returns into Collinsville formation showing much folding.

67.2 Road crosses an isolated lens of The Straits schist within the Collinsville, a stray bit of jelly.

67.5 Enter Thomaston quadrangle.

68.0 Outcrop on left (west) side of southbound lane shows south contact of The Straits in middle layer of jelly. As at 52.5,

this layer extends about a mile northeast of road and pinches out, wrapped around by cake and then the outside layer of jelly.

68.8 Outcrop on left (west) shows north contact of middle layer of jelly. This outcrop is very much worth a stop but must be visited from the southbound lane; we describe it beyond (mileage 74.9).

69.9 Enter town of Thomaston; beginning of Reynolds Bridge outcrop on left; this is Stop 9 of our itinerary.

70.2 Take Exit 38 off Route 8.

70.4 At end of ramp, turn left (west) under Route 8.

70.7 Traffic light; turn left (west) on Route 6.

71.1 Traffic light; jog left, then right (west) on Route 109.

71.9 Outcrop on right will be Stop 8.

72.0 **STOP 8:**

Parking area on left for dry dam across Branch Brook; turn in and park. Outcrops are on north side of Route 109. The Straits schist underlain down the hill by Collinsville formation. Coticule (quartz-spessartine rock), probably a metamorphosed manganiferous chert, can be found in the lowest layers of The Straits. The contact is the base of the upper layer of jelly in the jelly roll and can be followed east and then south to the top of the lower layer at 65.9, or south and then east to the north contact of the middle layer at 68.8.

Turn around and retrace route to traffic light at 70.7 (third light).

73.3 Traffic light (=70.7); turn right and then park at entrance to ramp onto Route 8 south (which we will take after the stop) to view the outcrops along the ramp and beyond.

STOP 9:

Reynolds Bridge outcrop in "Reynolds Bridge gneiss", a particularly disturbed part of Collinsville formation. Original rock was probably interlayered felsic and mafic volcanics; it was probably folded and metamorphosed once in the Taconic orogeny, then again in the Acadian orogeny when it was caught up in the core of the jelly roll. There has been considerable later retrogression, marked by clots of chlorite and epidote. About where ramp joins main Route 8, a late aplite dike cuts cleanly across all preceding structure; Seidemann (1980) obtained a Rb/Sr date of 345 $\pm$ 11 Ma for this dike and similar K/Ar dates for both the dike and the surrounding gneiss. The dike is not symmetrical and hence appears to have cooled in an inclined position, perhaps with nearly its present south dip. Somewhat farther along, a thinner dike with a gentle north dip also cuts across the older structure and contains large xenoliths whose source along the wallrock contact can be readily seen.

After Stop 9, proceed onto Route 8 south.

74.9 Optional Stop. Park where shoulder widens after first outcrops and before beginning of solid outcrop. The rocks at road level north of the parking spot belong to Collinsville formation, those to the south to The Straits schist. At road level, the contact dips steeply south, but traced upward it passes through vertical to north-dipping, then through horizontal to gently south-dipping, beyond which it forms a broad synform. A large aplite dike cuts through all the other rocks near the trough of the synform. Fairly large pods of marble follow part of the contact, especially where it descends to road level. The Straits schist contains tightly folded layers of quartz (once chert?) and coticule (once manganiferous chert?); some of these layers return on themselves in evident interference structures.

To return to New Haven, continue south on Route 8 to Exit 26 in Naugatuck; there pick up Route 63 south and follow it to New Haven. About 3 miles beyond the turn, Route 63 passes through the Straits, a defile in the lower layer of jelly, which there is turning northward around the southeast corner of the Waterbury dome and can be followed north and then west to the lower layer north of Waterbury (65.5 of itinerary). Distance from Stop 9 to Kline Geology Laboratory is about 30 miles.

REFERENCES

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Looking to the northwest at the outcrops of the Holyoke (center) and Talcott Flows (left), Branford, Connecticut. The Holyoke flow is offset by two faults - Route 1 follows the trace of the near fault, Interstate 95 the trace of the second fault. Lake Saltonstall is dammed behind the dip slope of the Holyoke Flow.

West Rock sill, looking north from the Westville area of New Haven, Connecticut. The sill dips shallowly to the east. To the left of the field of view, rocks of the Western Highlands crop out; the escarpment marks the unconformity between the Paleozoic metamorphic rocks and the overlying Mesozoic sedimentary rocks.