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Scientific Investigations Map 3440
Version 1.1, April 2020
Sheet 2 of 2

DISCUSSION

The bedrock geology was mapped to study the tectonic history of the area and to provide a framework for ongoing characterization of the bedrock of Vermont and New Hampshire. This Scientific Investigations Map of the Mount Ascutney 7.5- x 15-minute quadrangle consists of sheets 1 and 2 as well as an online geographic information system (GIS) database that includes contacts of bedrock geologic units, faults, outcrops, structural geologic information, and photographs. Sheet 1 of the report includes the bedrock geologic map. Sheet 2 includes a simplified tectonic map (fig. 1), and igneous rock geochemistry results (fig. 2; table 1) of the main map units from the Mount Ascutney stock. Sheet 2 also includes three cross sections from the geologic map on sheet 1, a tectonic map (fig. 3) showing major structural features, and a structural domain map (fig. 4) showing the orientation and distribution of measured joints, faults, and dikes with summary stereonets and rose diagrams. The report follows a preliminary report compiled for the Vermont part of the map area by Walsh and others (1996a, b).

The name "Mount Ascutney" has changed over the years on published topographic maps and in the geologic literature. Older published topographic maps listed the name as "Ascutney Mountain" and that name was applied in the classic scientific work by Daly (1903). Modern geographic usage lists the place name as "Mount Ascutney" and this report adopts that usage, except where the geologic nomenclature is well established, and there the term "Ascutney Mountain" is preserved.

SUMMARY OF BEDROCK GEOLOGY

The bedrock geology of the Mount Ascutney 7.5- x 15-minute quadrangle consists of highly deformed and metamorphosed Mesoproterozoic through Devonian metasedimentary and meta-igneous rocks intruded by rocks of the Mesozoic White Mountain Igneous Suite. In the west, Mesoproterozoic gneisses of the Mount Holly Complex are the oldest rocks and form the northeastern flank of the Chester dome (Ratcliffe and others, 2011). The allochthonous Cambrian through Ordovician rocks include the Moretown and Cram Hill Formations and the North River Igneous Suite; these rocks structurally overlie the Chester dome along the Keyes Mountain thrust fault (Ratcliffe, 2000a, b; Ratcliffe and others, 2011), which may represent the ancient Ordovician suture (Red Indian line) between crustal blocks with Laurentian versus Ganderian affinity (Macdonald and others, 2014; Valley and others, 2019). Silurian and Devonian metasedimentary and metavolcanic rocks of the Connecticut Valley trough (CVT) unconformably overlie the pre-Silurian rocks. The easternmost extent of the CVT in New Hampshire is exposed in the Meriden antiform. Ordovician to Silurian and Devonian metasedimentary rocks of the Bronson Hill anticlinorium, sometimes referred to as the "New Hampshire sequence" (Billings, 1937, 1956; White and Jahns, 1950; Rankin and others, 2013), structurally overlie the CVT along the Monroe thrust fault. The oldest part of the Bronson Hill anticlinorium, called the Bronson Hill arc, consists of Ordovician metamorphosed volcanic, plutonic, and sedimentary rocks of the Ammonoosuc Volcanics, the Partridge Formation, and the Oliverian Plutonic Suite. The Ammonoosuc Volcanics represent the base of the exposed section in the area. The rocks of the Bronson Hill arc may be partly correlative with the pre-Silurian rocks above the Chester dome (Valley and others, 2019) and are exposed in two fault-bounded structural belts (Cornish City and Claremont belts) and in the Sugar River dome (fig. 2). Collectively, these belts form the regional Orfordville anticlinorium, Hardscrabble synclinorium, and the western part of the broader Bronson Hill anticlinorium in western New Hampshire (fig. 1). Silurian to Devonian metasedimentary rocks of the Clough Quartzite, and Fitch and Littleton Formations unconformably overlie the rocks of the Bronson Hill arc. Devonian granitic and pegmatitic dikes and sills of the New Hampshire Plutonic Suite intruded previously deformed rocks. Post-tectonic Cretaceous plutonic and volcanic rocks of the Ascutney Mountain Intrusive Complex (new formal name) underlie Mount Ascutney and Little Ascutney in the map area and in the adjacent Cavendish quadrangle (Ratcliffe, 1995a, 2000a). Informally referred to as the "Ascutney Mountain igneous complex" (Foland and others, 1985; Schneiderman, 1989, 1991; Ratcliffe and others, 2011), the name is formalized here as an intrusive complex in accordance with the North American Stratigraphic Code, article 37 (Easton and others, 2016, p. 220). The intrusive complex contains both intrusive and extrusive igneous rock types that are all lithodemic units within the White Mountain Igneous Suite (Ratcliffe and others, 2011). The complex only occurs in eastern Windsor County, Vermont, and the type locality includes exposures on the peaks of Mount Ascutney and Little Ascutney. Hitchcock (1884) first used the name "Mount Ascutney granite" for rocks that only occurred at Mount Ascutney. Foyles and Richardson (1929) used the obsolete term "Mount Ascutney nordmarkite," which referred only to the syenite, and since the intrusive complex contains more than just granite and syenite these two names are obsolete. The Ascutney Mountain Intrusive Complex includes syenite, granite, aplite, gabbro, and diorite, with screens and xenoliths of co-magmatic volcanic rocks. Mount Ascutney is the classic location where Daly (1903) discussed the evidence for piecemeal stoping as a pluton emplacement mechanism. This theory was later modified to favor cauldron subsidence, or ring-fracture stoping, as an alternative mode of emplacement (Chapman and Chapman, 1940). Our new mapping supports the cauldron subsidence model, and shows that the main Ascutney Mountain stock is a funnel-shaped composite pluton in agreement with geophysical data (Daniels, 1990). Because of the historically significant scientific research, and its prominence in the landscape, Mount Ascutney is commonly regarded as Vermont's most famous volcano.

The oldest structure in the bedrock is a relict gneissosity in the Mesoproterozoic Mount Holly Complex in the Chester dome. At or near the contact with the pre-Silurian cover rocks, the Mesoproterozoic gneissosity was dragged into parallelism with a penetrative foliation that is a second-generation foliation in the pre-Silurian cover rocks. This second-generation foliation is axial planar to abundant isoclinal and reclined folds of both the gneissosity in the Mount Holly Complex and the schistosity in the overlying pre-Silurian rocks. This fabric is interpreted to be a relict Taconian foliation perhaps related to movement along the Keyes Mountain thrust fault. A younger and almost certainly Acadian foliation is also found subparallel to this older Taconian schistosity in the pre-Silurian rocks.

In contrast to the pre-Silurian rocks above the Chester dome, there is no clear evidence in the map area for an Ordovician deformational fabric in the exposed pre-Silurian rocks in the Bronson Hill arc; such evidence does exist in the older rocks beneath the Ammonoosuc Volcanics in the Albee Formation in the Littleton, New Hampshire area (Rankin and others, 2013). This implies that the Ammonoosuc Volcanics post-date regional deformation related to an orogenic episode interpreted as either Taconian or Penobscottian (Rankin and others, 2013).

The oldest foliation in the Silurian and Devonian rocks is a bed-parallel schistosity (Acadian S_1) containing rarely observed isoclinal folds (Acadian F_1). These folds are the nappe-stage folds of Thompson and others (1968). Only in the hinge regions of these early F_1 folds is it possible to see bedding that is not parallel to a foliation. Both the Connecticut Valley trough and Bronson Hill anticlinorium (BHA) rocks possess this first generation (Acadian S_1) schistosity, but they do not appear to have developed under the same metamorphic conditions. The S_1 foliation in the BHA appears to have developed prior to or during peak metamorphism that reached as high as staurolite grade (Walsh and others, 2012), but the S_1 foliation in the western part of the CVT developed prior to the peak of upper greenschist-facies metamorphism. In the western CVT, relative age relationships between porphyroblasts and fabric suggest that peak metamorphic conditions occurred during or after Acadian S_2 development.

The second-generation planar fabric in all the Silurian and Devonian rocks (Acadian S_2) varies from a non-penetrative cleavage to a penetrative schistosity. Folds associated with the second-generation planar fabric (Acadian F_2) vary from open to isoclinal with generally consistent shallow plunges to both the north and south, but locally the plunges are quite steep. Acadian S_1 and S_2 are the most dominant, or visibly conspicuous, planar fabrics in the Silurian and Devonian rocks. Locally, these two planar fabrics are parallel, and it is difficult to discern one from the other. In such places where only a single penetrative schistosity is observed, and no crosscutting relative age relationships can be discerned, a foliation symbol is used to represent a dominant foliation (S_n) on the map. Acadian S_1 and S_2 are deformed by a minimum of two younger cleavages. The next youngest generation of planar fabrics include broad to open folds (F_3) with both shallow and steep fold hinges and associated millimeter- to centimeter-spaced cleavage (S_3). These structures have many different orientations, although they most commonly strike northeast, dip vertically to steeply northwest, and locally have sinistral rotation senses in the eastern part of the map. These structures are, in part, related to the last stages of doming, and the older Acadian S_1 and S_2 planar fabrics are deformed by them. It is not certain whether these younger "dome-related" structures are entirely coeval across the map. The S_1 fabric is interpreted as Acadian, the S_2 fabric is interpreted as Acadian to Neo-Acadian or even Alleghanian, and the S_3 fabric is Alleghanian. Late-stage F_3 folds locally show preferred left-lateral rotation sense and are probably related to late dome-stage Alleghanian deformation or motion along lower greenschist-facies regional faults that were active at around 300 million years before present (Ma, mega-annum) (McWilliams and others, 2013) or between 310 and 280 Ma (McAleer and others, 2017). The Bald Mountain shear zone shows that the re-activation of S_2 fabric occurred during lower greenschist-facies metamorphism, with white mica recrystallization taking place as young as the Early Triassic where white mica yields $^{40}Ar/^{39}Ar$ ages of about 250 Ma (McAleer and others, 2016).

The youngest generation cleavage (S_4) in the area is a 1- to 30-cm-spaced cleavage that locally occurs as parallel sets of kink bands or low-amplitude, high-wavelength folds with variable fold hinge orientations. Secondary minerals, mainly quartz, calcite, and dolomite, occur as vein-filling material in the cleavage planes. This latest generation of cleavage generally strikes east-west and dips sub-vertically, sub-parallel to the regional joint trend (fig. 4). This cleavage, and the outcrop-scale and map-scale brittle faults in the area, may be related to Mesozoic extension (Hatch, 1988). In the Hartland and North Hartland quadrangles to the north, the kink bands are spatially related to the Ammonoosuc fault (Walsh, 2016), but sufficient data were not observed in this map area to demonstrate spatial correlation between kink bands and brittle faults. The youngest deformation is characterized by Mesozoic brittle faulting, kink bands, motion along the Ammonoosuc fault and smaller unnamed faults, possible re-activation of the Sumner Falls and Northey Hill shear zones, and subsequent jointing (figs. 3 and 4).

Rocks of the Mount Holly Complex in the core of the Chester dome may have reached hornblende-granulite-facies metamorphic conditions during the Mesoproterozoic Grenvillian orogenic events, and experienced subsequent metamorphism at lower grades during both the Ordovician (Taconic) and Devonian (Acadian) orogenic events. Peak metamorphic conditions in the Chester dome reached staurolite-kyanite grade during Paleozoic metamorphism, but direct evidence of Grenvillian granulite-facies metamorphism is lacking (Ratcliffe, 2000a, b). Paleozoic metamorphism locally attained amphibolite-facies conditions in the basement rocks, the pre-Silurian sequence, the eastern part of the BHA, and the western part of the CVT, but attained only greenschist-facies conditions in parts of the central CVT and BHA during the Acadian orogeny. We did not identify relict Taconian metamorphic mineral assemblages in the pre-Silurian rocks in this area, perhaps due to the thoroughness of recrystallization associated with the Acadian metamorphic overprint. The Monroe fault carried the BHA rocks over the CVT during an early Acadian F_1 nappe-stage event that pre-dated lower amphibolite-facies peak metamorphism. The onset of doming occurred during F_2 deformation, which folded the Monroe thrust sheet, folded earlier isograds, and created the Meriden antiform and related structures. Doming continued as evidenced by the deformation of D_2 by the D_3 structures. Lower greenschist-facies (Alleghanian) faults such as the Sumner Falls and Northey Hill shear zones truncated peak-metamorphic assemblages, isograds, and older F_1 folds and faults. These faults experienced a protracted history and played a major role in the metamorphic discontinuity documented along the Connecticut River Valley, evidenced by amphibole and muscovite $^{40}Ar/^{39}Ar$ ages of ~380 and ~330 Ma in Vermont, and ~330 and ~270 in New Hampshire (Harrison and others, 1989; McWilliams and others, 2013; McAleer and others, 2015). Additionally, in the vicinity of the Bald Mountain shear zone, $^{40}Ar/^{39}Ar$ data from muscovite record a mixture of cooling ages of ~300 Ma and crystallization ages of ~245 Ma. The younger ages are associated with new muscovite and pseudomorphic replacement of staurolite, and the younger ages expand the occurrence of ductile deformation and down-to-the-east normal extension in the area into the Triassic (McAleer and others, 2014, 2015, 2016). These ages suggest that the peak metamorphic conditions developed during the Acadian orogeny and that retrograde greenschist-facies metamorphism occurred during the Alleghanian orogeny. Apatite fission-track data indicate that the Ammonoosuc fault was active prior to about 100 Ma and experienced little to no reactivation in the Cretaceous, but other regionally significant older ductile shear zones (such as the Northey Hill shear zone) experienced Late Cretaceous (approximately <80 Ma) reactivation (Roden-Tice and others, 2009). Recent data suggest some Cretaceous activity on regional brittle faults (for example, the Grantham fault in the Springfield quadrangle to the south) may have extended into the Paleocene (Schnalzer and others, 2015). The sense of displacement (shown on sheets 1 and 2) is identified where it was observed along faults, but given the protracted history (discussed above) the faults may be reactivated and may show varying senses of motion.

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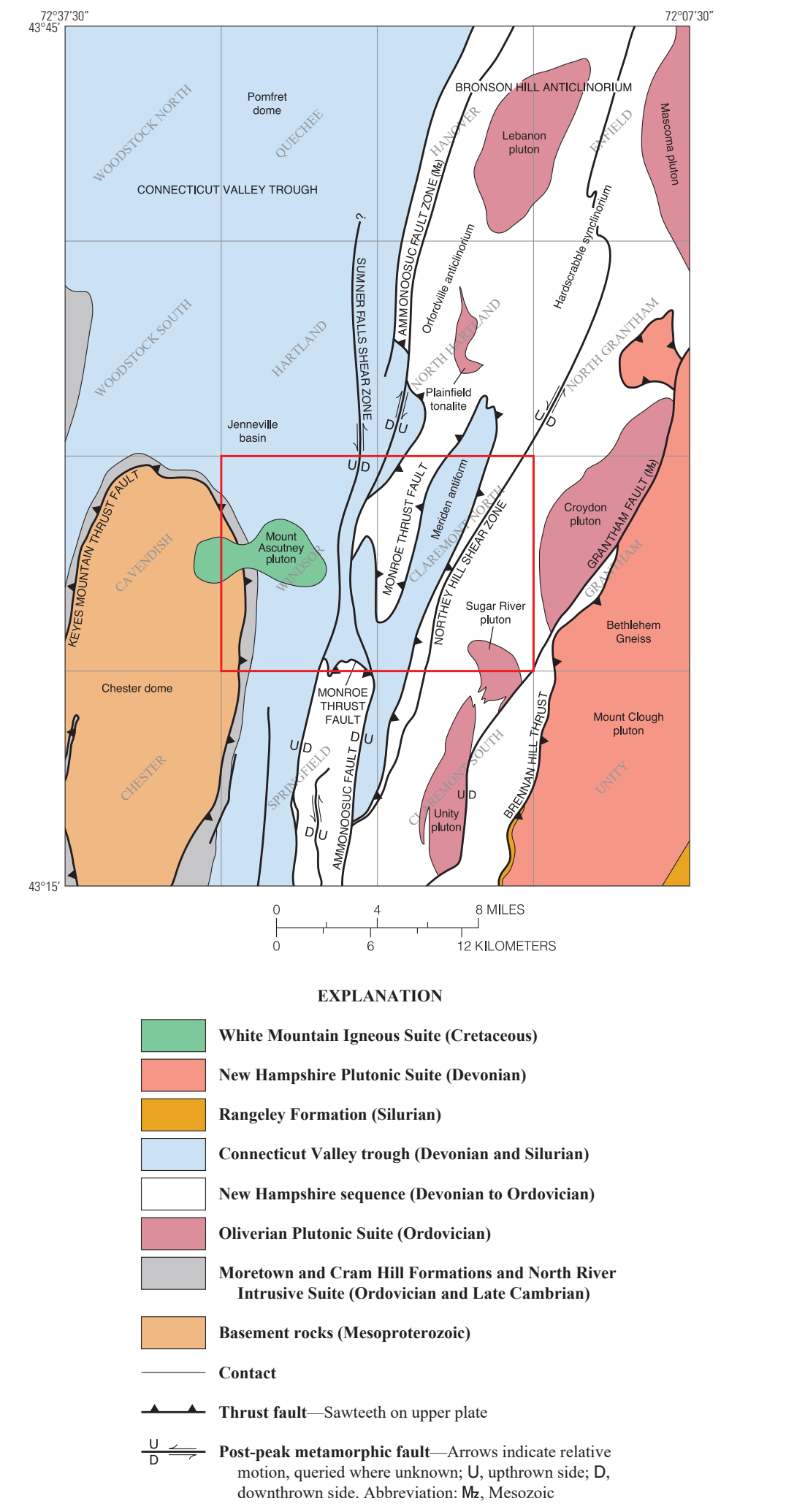


Figure 1. Simplified tectonic map and index to 7.5-minute quadrangles (outlined in gray). Modified from Ratcliffe and others (2011) and Lyons and others (1997). The area of this report is outlined in red.

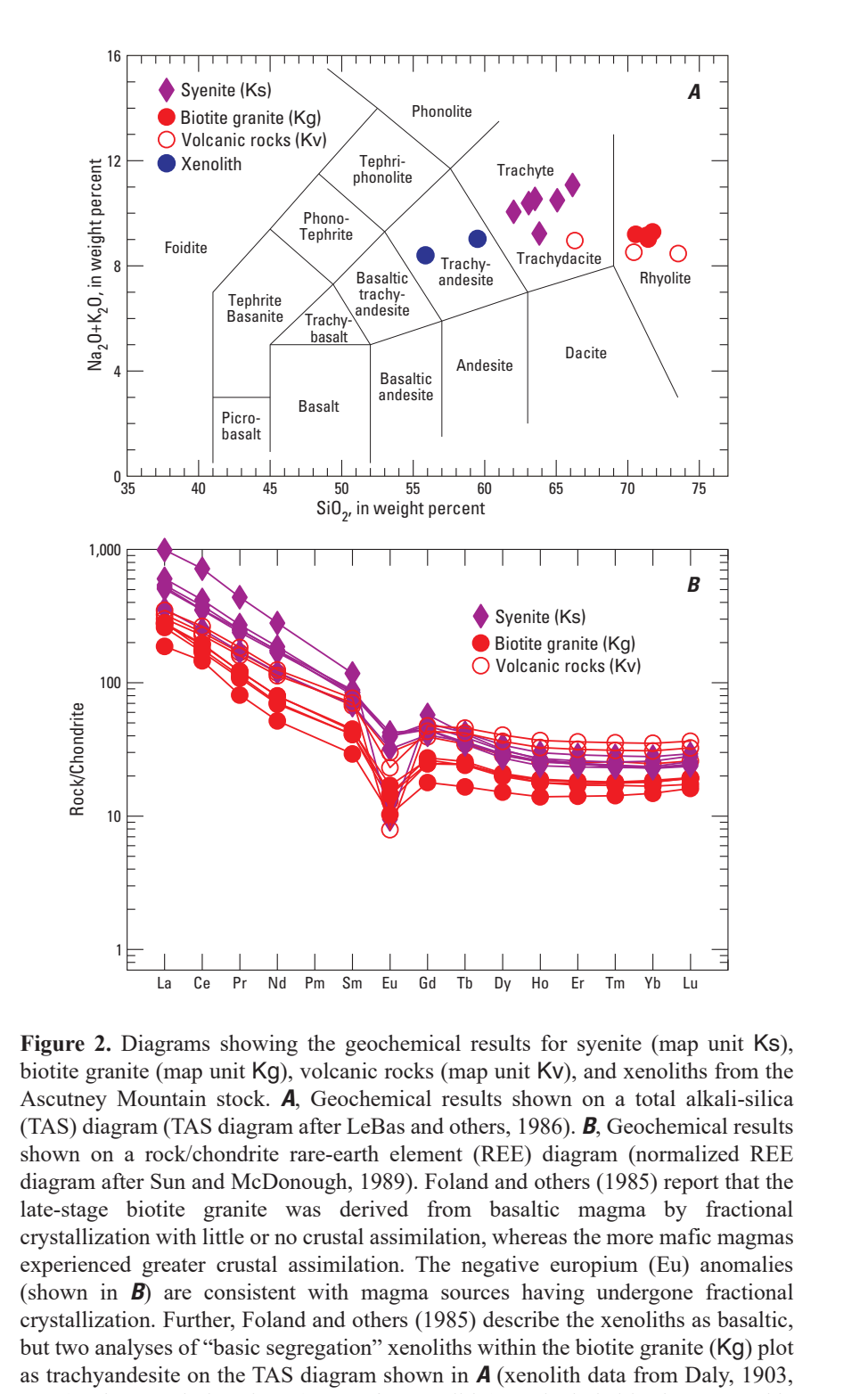


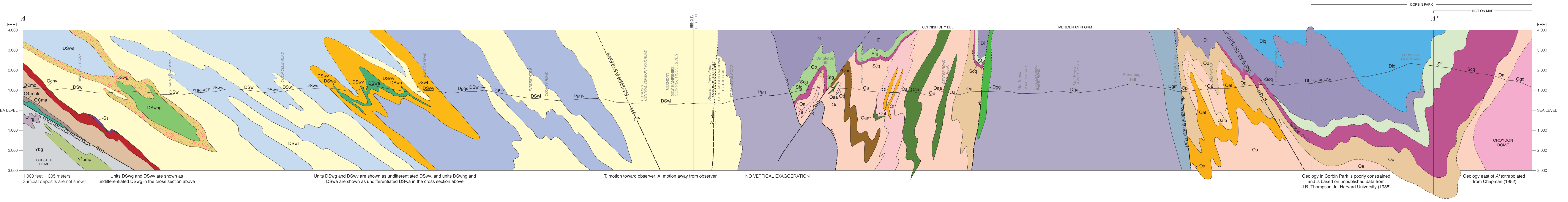
Figure 2. Diagrams showing the geochemical results for syenite (map unit Ks), biotite granite (map unit Kg), volcanic rocks (map unit Kv), and xenoliths from the Ascutney Mountain stock. ***A***, Geochemical results shown on a total alkali-silica (TAS) diagram (TAS diagram after LeBas and others, 1986). ***B***, Geochemical results shown on a rock/chondrite rare-earth element (REE) diagram (normalized REE diagram after Sun and McDonough, 1989). Foland and others (1985) report that the late-stage biotite granite was derived from basaltic magma by fractional crystallization with little or no crustal assimilation, whereas the more mafic magmas experienced greater crustal assimilation. The negative europium (Eu) anomalies (shown in ***B***) are consistent with magma sources having undergone fractional crystallization. Further, Foland and others (1985) describe the xenoliths as basaltic, but two analyses of "basic segregation" xenoliths within the biotite granite (Kg) plot as trachyandesite on the TAS diagram shown in ***A*** (xenolith data from Daly, 1903, p. 84). The sample locations (except for xenoliths) are included in the geographic information systems database. See Cox (1987) for the geochemical results for trace elements from rock, stream-sediment, soil, and panned concentrate samples for the entire Ascutney Mountain Intrusive Complex and the observation of a minor gold anomaly in gray sulfidic schist that is south and east of Mount Ascutney.

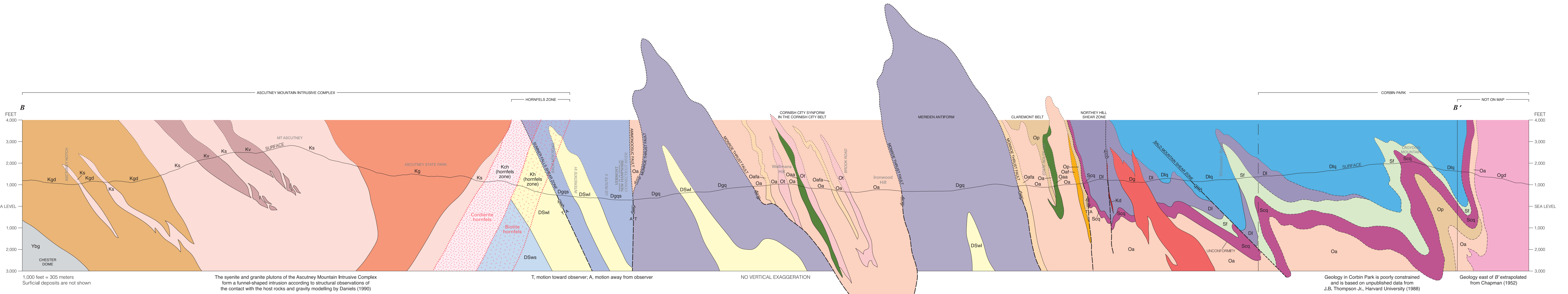
Photograph of Mount Ascutney and the Cornish-Windsor Covered Bridge from Cornish, New Hampshire, looking southwest across the Connecticut River towards Windsor, Vermont. Photograph by G.J. Walsh.

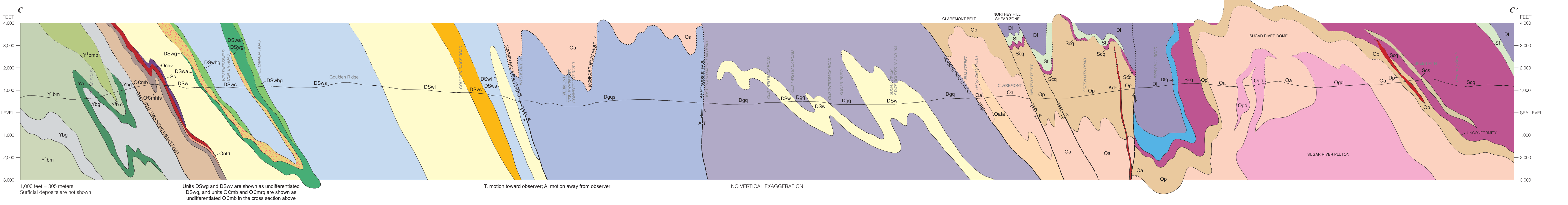
Table 1. Whole-rock geochemistry results of map-unit rock samples from the Ascutney Mountain Intrusive Complex.

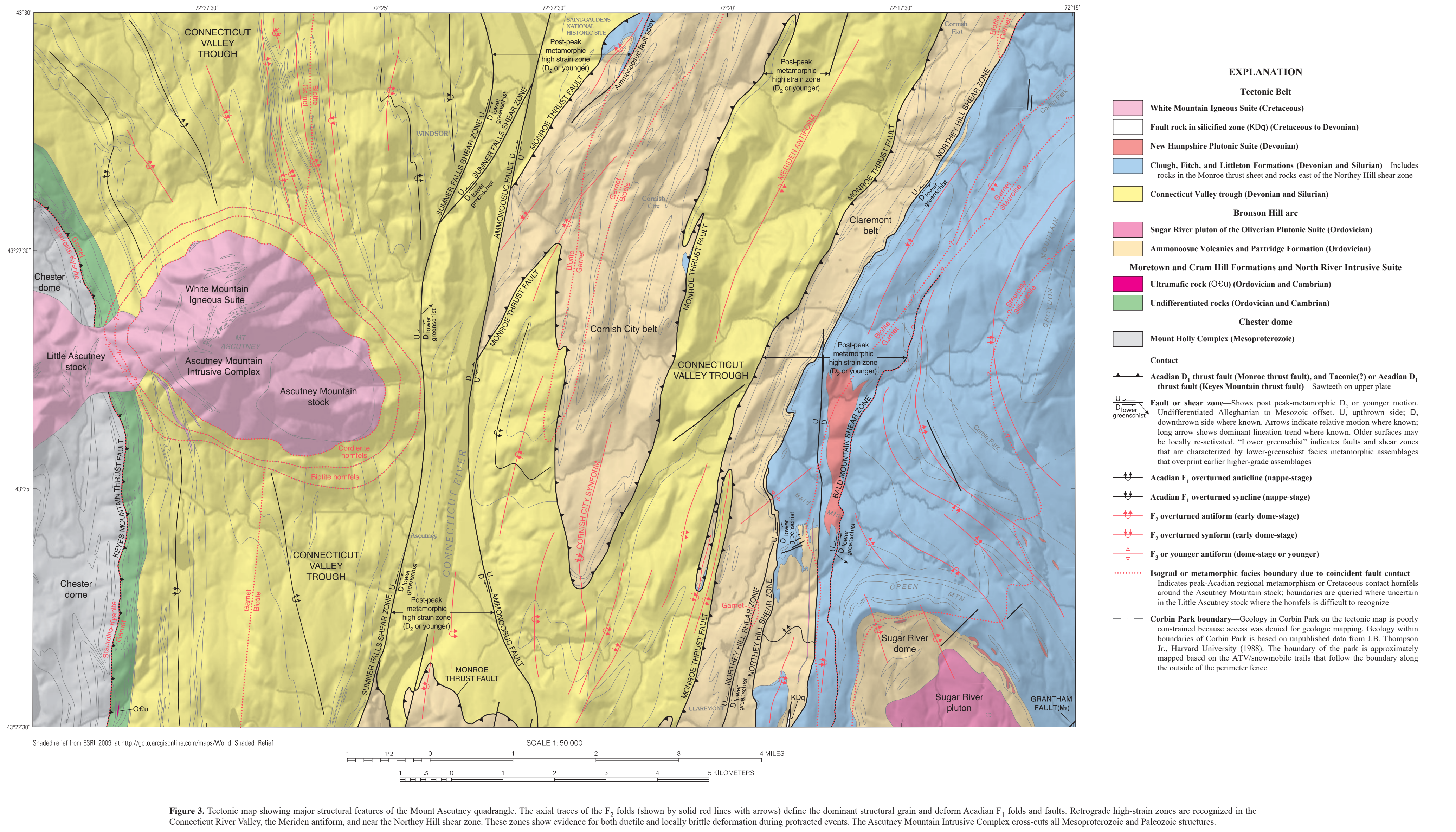
[Major elements are expressed as oxides. Whole-rock geochemistry by Actlabs, Acaster Ontario, Canada, using lithium metaborate/tetraborate fusion analysis by inductively coupled plasma (ICP) mass spectrometry (MS). Abbreviations: LOI, loss on ignition; MA, Mount Ascutney; ppm, parts per million]

	Map unit	Ks	Kv	Kg	Kg	Ks	Ks	Ks	Kg	Kg	Ks	Kg	Ks	Kv	Kv
	Sample number	MA-3030	MA-3033	MA-3042	MA-3048	MA-3084	MA-3117	MA-3162	MA-3169	MA-3175	MA-3193	MA-3219	MA-3251	MA-510	MA-511
	Description	Syenite	Volcanic rock	Biotite-granite	Biotite-granite	Syenite	Syenite	Syenite	Biotite-granite	Biotite-granite	Syenite	Biotite-granite	Syenite	Volcanic rock	Volcanic rock
Major element concentration, in weight percent	SiO_2	65.07	66.3	71.37	71.74	62.03	63.82	66.14	71.29	70.56	63.51	71.43	63.08	70.43	73.53
	Al_2O_3	15.93	15.41	13.84	13.95	16.48	15.36	15.98	14.05	14.82	16.37	13.69	16.62	13.9	13.11
	Fe_2O_3	4.24	3.87	2.41	2.22	5.38	5.14	3.1	2.35	2.86	4.24	2.32	4.47	2.78	1.93
	MnO	0.128	0.051	0.065	0.05	0.146	0.107	0.081	0.064	0.05	0.127	0.037	0.141	0.041	0.039
	MgO	0.78	0.46	0.39	0.36	1.25	1.33	0.15	0.38	0.41	0.74	0.33	0.77	0.28	0.31
	CaO	1.67	1.58	0.96	0.98	2.51	2.19	0.88	0.94	0.71	1.71	0.73	1.75	1.05	0.71
	Na_2O	4.91	4.72	4.43	4.5	4.88	4.58	5.13	4.48	4.48	4.92	4.32	4.81	3.56	3.65
	K_2O	5.59	4.24	4.69	4.79	5.18	4.65	5.95	4.67	4.72	5.63	4.7	5.58	4.96	4.82
	TiO_2	0.561	0.896	0.314	0.266	0.845	0.661	0.241	0.286	0.387	0.574	0.292	0.594	0.398	0.299
	P_2O_5	0.13	0.25	0.09	0.06	0.21	0.16	0.02	0.09	0.12	0.13	0.08	0.14	0.1	0.07
	LOI	0.45	0.43	0.65	0.61	0.26	0.57	0.37	0.14	0.61	0.25	0.33	0.32	0.49	0.27
	Total, in percent	99.47	98.19	99.20	99.54	99.17	98.57	98.05	98.72	99.73	98.19	98.25	98.28	97.99	98.73
Trace element concentration, in ppm	Sc	7	6	2	1	9	7	7	1	2	8	1	8	4	3
	Be	3	4	8	7	3	4	3	9	8	3	7	2	6	6
	V	17	45	15	13	38	38	<5	16	20	17	14	17	16	16
	Cr	<20	<20	<20	<20	20	40	<20	<20	<20	<20	<20	<20	<20	<20
	Co	4	5	3	2	7	8	<1	3	4	4	3	4	5	1
	Ni	<20	<20	<20	<20	20	20	<20	<20	<20	<20	<20	<20	<20	<20
	Cu	<10	<10	<10	<10	10	20	<10	<10	20	<10	<10	<10	<10	<10
	Zn	110	70	40	40	110	90	80	40	40	110	30	110	50	50
	Ga	27	28	27	26	27	27	29	26	27	28	26	27	28	31
	Ge	3.4	3.8	3	3.1	3.3	2.8	3.3	2.8	2.9	3	2.9	3.1	3.7	3.1
	As	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Rb	132	207	237	220	115	159	137	255	246	118	253	105	183	254
	Sr	122	262	193	183	202	162	11	204	238	141	184	132	168	73
	Y	44.5	38.3	31.8	29.4	40.1	39.5	36.3	28.9	26.9	34.4	22.2	37.1	48.3	56.2
	Zr	852	572	289	265	806	607	487	284	340	938	304	862	487	421
	Nb	102	123	158	145	110	113	87.9	147	155	83.9	151	85.2	149	159
	Mo	6	4	<2	<2	7	4	18	<2	3	3	4	4	<2	2
	Ag	1.4	0.9	<0.5	<0.5	1.2	0.8	0.7	<0.5	<0.5	1.3	<0.5	1.2	0.5	<0.5
	In	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	< 0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Sn	5	2	7	8	4	7	5	7	7	5	7	4	5	3
	Sb	0.2	<0.2	0.4	<0.2	<0.2	0.3	<0.2	0.2	<0.2	<0.2	0.2	<0.2	0.2	<0.2
	Cs	1.6	5.2	3	1.5	1.3	2.6	1.5	3.3	3.7	1.8	2.8	1.9	4	2.8
	Ba	799	685	394	352	721	864	64	384	499	882	357	825	613	163
	La	124	76.9	65.1	61.5	120	84.8	235	66.9	66.2	143	44.4	128	71.5	82.8
	Ce	216	146	118	104	214	154	439	109	120	256	89.4	231	139	162
	Pr	23.6	16	11.6	10.3	22.7	16.2	41.6	10.7	11.5	25.8	7.69	23.8	15.2	17.5
	Nd	81.7	55.4	37.1	32.3	78.8	56	131	33.1	37.2	87.2	24.2	81.2	52.8	58.3
	Sm	13.5	10.3	6.88	6.26	12.9	10.4	18	6.26	6.7	13	4.48	12.4	10.8	11.7
	Eu	2.28	1.74	0.845	0.752	2.3	1.85	0.549	0.842	0.986	2.46	0.596	2.32	1.34	0.459
	Gd	10.2	8.08	5.62	5.07	9.77	8.36	11.8	5.09	5.42	9.13	3.67	9.15	8.9	9.76
	Tb	1.58	1.3	0.96	0.91	1.46	1.35	1.55	0.92	0.9	1.29	0.62	1.34	1.57	1.71
	Dy	8.66	7.28	5.32	5.22	7.89	7.47	8.01	5.19	5.04	6.92	3.84	7.25	9.24	10.3
	Ho	1.69	1.45	1.07	1.05	1.53	1.47	1.5	1.01	1.01	1.35	0.79	1.44	1.85	2.09
	Er	4.77	4.16	3.03	2.98	4.3	4.05	4.13	2.89	2.82	3.87	2.33	4.07	5.25	5.97
	Tm	0.721	0.652	0.46	0.455	0.649	0.615	0.615	0.449	0.434	0.59	0.363	0.596	0.793	0.905
	Yb	4.75	4.2	3.15	3.05	4.39	3.87	4	3.07	2.85	3.92	2.52	3.89	5.24	5.98
	Lu	0.746	0.658	0.493	0.489	0.715	0.6	0.651	0.488	0.44	0.623	0.41	0.61	0.824	0.927
	Hf	15.3	12.7	7.4	7.2	14.5	11.9	10.6	7.3	8	15.9	7.4	14.8	12.4	11.8
	Ta	6.28	8.62	13.3	12.8	7.54	7.55	5.06	13	12.9	5.34	12.9	4.92	10.5	11.9
	W	1.7	3.1	3.2	2.1	2	6.1	1.4	3.6	3.1	1.7	5.1	1.7	2.9	3.4
	Tl	0.29	0.43	0.38	0.32	0.22	0.27	0.28	0.4	0.43	0.23	0.41	0.21	0.43	0.56
	Pb	13	21	11	10	8	9	10	9	9	10	9	10	17	10
	Bi	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Th	12.9	17.6	33.4	33.1	12.8	15.9	26	37.8	31.5	15.5	34.7	12.4	20.3	26
	U	2.21	4.56	5.34	6.5	2.37	2.64	3.53	7.51	6.13	2.34	6.57	2.02	5.25	5.93









Shaded relief from ESRI, 2009, at http://goto.arcgisonline.com/maps/World_Shaded_Relief

Figure 3. Tectonic map showing major structural features of the Mount Ascutney quadrangle. The axial traces of the F_2 folds (shown by solid red lines with arrows) define the dominant structural grain and deform Acadian F_1 folds and faults. Retrograde high-strain zones are recognized in the Connecticut River Valley, the Meriden antiform, and near the Northey Hill shear zone. These zones show evidence for both ductile and locally brittle deformation during protracted events. The Ascutney Mountain Intrusive Complex cross-cuts all Mesoproterozoic and Paleozoic structures.

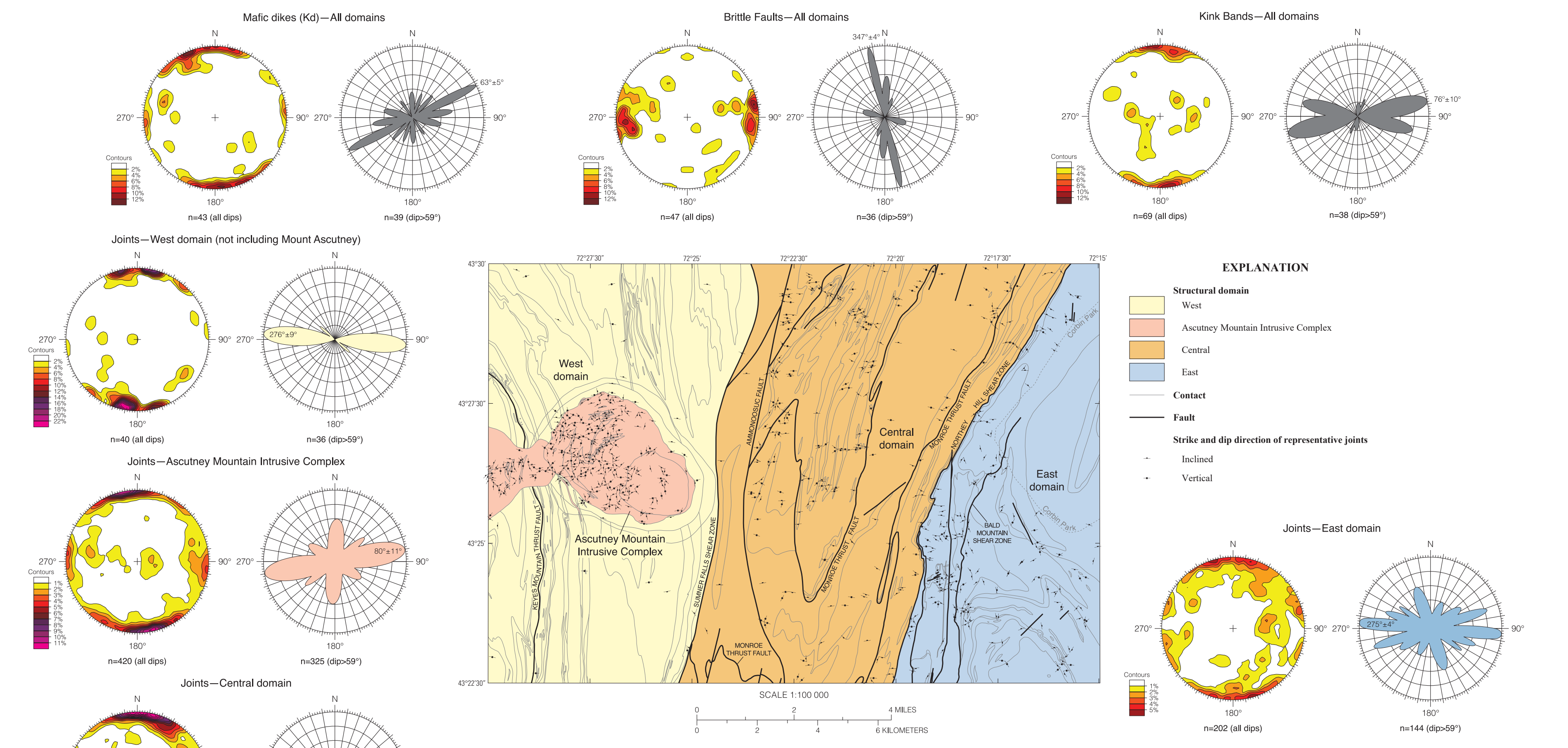


Figure 4.—Structural domain map of the Mount Ascutney quadrangle showing the orientation and distribution of representative measured brittle features. Structural domain boundaries are divided by the Ascutney Mountain Intrusive Complex, the Sumner Falls shear zone (divides west and central domains), and the Northey Hill shear zone (divides central and east domains). The map shows the locations and data results for measured outcrop-scale joints, kink bands, brittle faults, and Cretaceous mafic dikes (map unit Kd). Results for measured joint data are summarized on four pairs of diagrams (at left and right of map) separated into four structural domains: the Ascutney Mountain Intrusive Complex and the west, central, and east domains. Each pair includes a stereonet and a rose diagram. Results for measured kink bands include all four structural domains shown on one stereonet and rose diagram (at top of map). Locations and data results for measured outcrop-scale brittle faults and Cretaceous mafic dikes (map unit Kd) are shown at top of map and also include all four structural domains. For all stereonets, contoured poles to the associated brittle features are shown along with the strike and dip orientations for poles to the principal planes in the dataset. For all rose diagrams a normalized subset of the data is shown in the corresponding stereonet for dips >59°, and principal peaks are shown with 1 standard deviation (for example, 276°±9° for the joints in the west domain). The number of data points is indicated by "n" at the bottom of each diagram. Stereonets and rose diagrams were plotted using the Structural Data Integrated System Analyser (DAISY, version 4.95.05) software by Salvini and others (1999) and Salvini (2013). Consult the GIS database for the complete data, which are not plotted on the figure due to cartographic constraints. Note that the outcrop-scale strike and dip symbols for joints and brittle faults are not shown on the geologic map (sheet 1). Also, the limited number of joint measurements in the west domain reflects limited fracture data collection in the previous study by Walsh and others (1996a, b) and does not indicate that the rocks are less jointed in the west domain. No structural measurements were taken in Corbin Park because access to the park was denied.

Bedrock Geologic Map of the Mount Ascutney 7.5- x 15-Minute Quadrangle, Windsor County, Vermont, and Sullivan County, New Hampshire

By

Gregory J. Walsh,[1] Peter M. Valley,[1] Peter J. Thompson,[2] Nicholas M. Ratcliffe,[1] Brooks P. Proctor,[3] and Karri R. Sicard[4]

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[1] U.S. Geological Survey;
[2] University of New Hampshire;
[3] Naval Surface Warfare Center;
[4] Alaska Department of Natural Resources

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