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PYRITE AND OTHER MINERALS FROM BARGER'S QUARRY NEAR LEXINGTON, VIRGINIA

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Barger's quarry is located just east of the city limits of Lexington in Rockbridge County, Virginia (Figure 1). This quarry offers a unique opportunity to collect complex and varied forms of pyrite and well formed crystals of barite, calcite, fluorite, and quartz. Although Barger's quarry has long been known to mineral collectors in Virginia, very little information has been published on the mineralogy of the quarry. Pomerantz (1940) briefly describes pyrite crystals from the quarry, and Franklin (1977) describes some of the pyrite forms as well as the geology of the area.

The original quarry site was opened on the east side of U. S. Highway 60 by Howard A. Donald around 1922. He operated the quarry until 1932 when Charles W. Barger took over the operation. The quarry has remained in the Barger family and is currently being operated under the name of Charles W. Barger and Son.

The quarry has supplied construction aggregate to the Rockbridge County area continuously since 1922. In 1975 the original quarry began to fill with water, and the operation was moved west of U. S. Highway 60 where it is still active today.

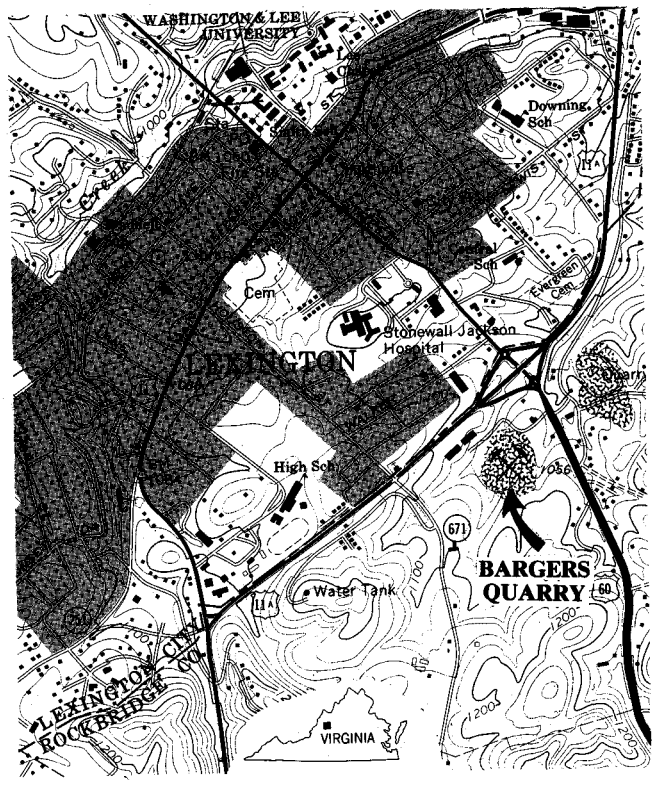

Figure 1. Location of Barger's quarry in Rockbridge County, Virginia.

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BACKGROUND

Rare and complex forms of pyrite were recognized in the Lexington, Virginia area as early as 1886. During that year John G. Meem of the Virginia Military Institute published a paper describing pseudomorphs of limonite after pyrite (Meem, 1886). Drawings from his paper show that a large number of the crystals that he studied displayed the octahedal form, but they were almost always in combination with other forms (Figure 2). Specimens collected during this early research were sent to the Smithsonian Institution where they were put into the National Study Collection of Minerals. More recently Dietrich (1977) reviewed Meem's paper in a special report on pseudomorphs. The area that Meem described as "a hill sloping gently to a small stream (Huffman's Run) about 0.75 mile southeast of Lexington" is the location of the present Barger's quarry operation. Specimens similar to the ones illustrated in his paper can still be found in the quarry and in soils surrounding the quarry.

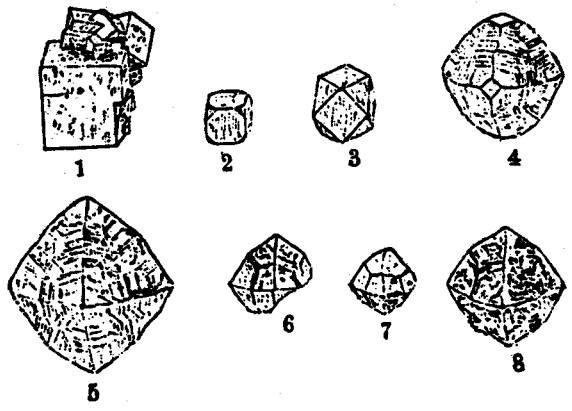

Figure 2. Drawings from Meem's 1886 report showing limonite pseudomorphs after pyrite (plate courtesy of R. V. Dietrich).

DESCRIPTION OF THE PYRITE

Pyrite may crystallize in one of more forms within the isometric crystal system. These include simple cubes, octahedrons, modifications of the pyritohedron, and oscillatory combinations of various forms, including the trigonal trisoctahedron and trapezohedron.

At Barger's quarry the octahedron is the dominant form of crystallization although, as stated previously, crystals are usually found in combination with other forms. Intergrowths of large and small octahedral crystals may occur in the same specimen (Figure 3). The octahedral pyrite crystals from Barger's quarry should rank among the finest in the United States (Figure 4). These crystals

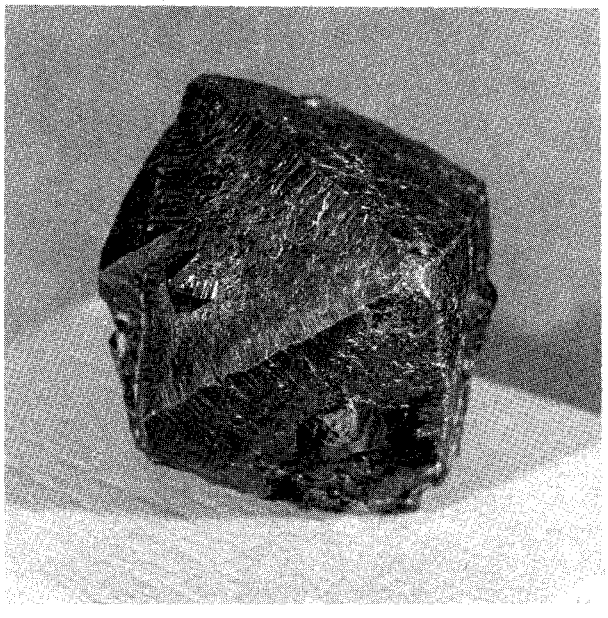

Figure 3. Intergrowths of large and small octahedral pyrite crystals; specimen 2 inches long (photograph by T. M. Gathright, II).

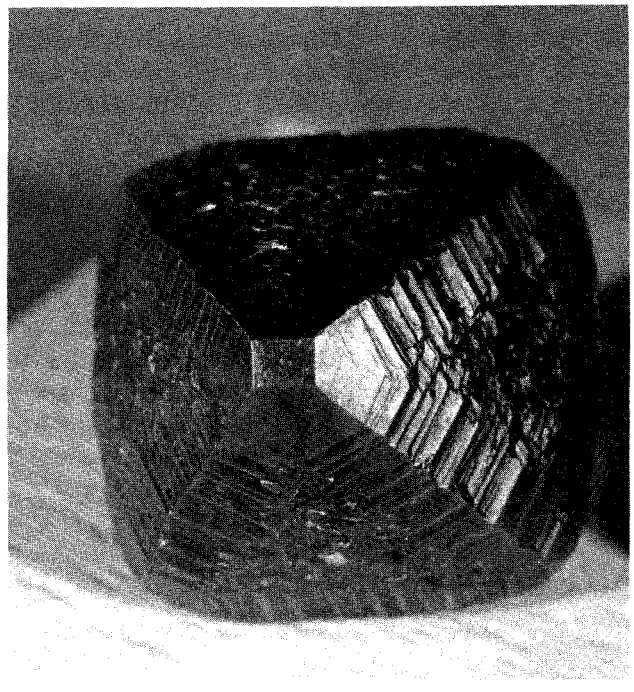

Figure 4. Pyrite crystal showing cubic and striated octahedral faces; crystal 1.3 inches across (photograph by T. M. Gathright, II).

range in size from 0.1 inch to 2 inches in length with 1 inch being about average. Crystals that have dominant octahedral forms are generally combined with the cubic form. These combinations are represented by crystals that range from those having large octahedral faces and small cubic faces to ones having large cubic faces with small octahedral faces. Rarely, crystals show combinations of large cubic and octahedral faces (Figure 5).

Striations occur on most of the octahedral faces. These strations run at right angles to the edges of the octahedron and apparently represent the oscillatory development of trapezohedral faces. In some of the combinations of the cube and the octahedron, the faces of the latter were unequally developed while those of the cube were elongated into rectangles. On rare occasions two crystals may intergrow in such a way as to resemble a twin (Figure 6).

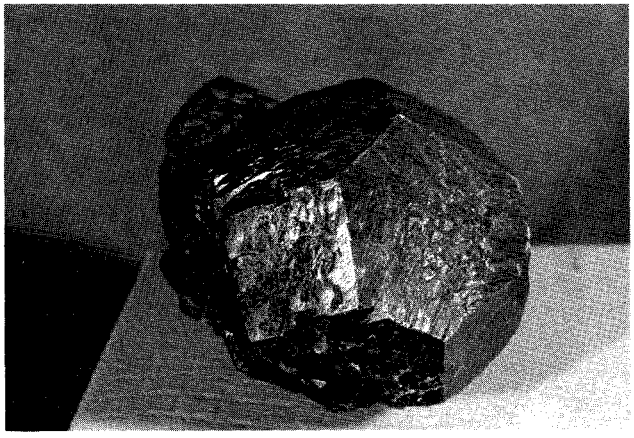

Figure 5. Two-inch pyrite crystal with combination of large cube and octahedral faces. (H. L. Grow specimen; photograph by T. M. Gathright, II).

Figure 6. Intergrowth of two pyrite crystals which resembles twinning. The crystals show dominance of octahedral form; crystals 1 inch long (photograph by H. Freeland).

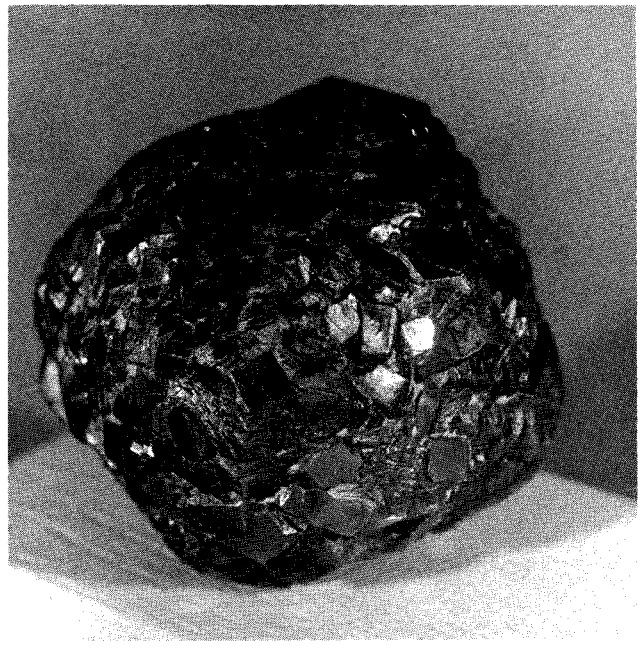

Figure 7. Aggregate of pyrite crystals dominated by the cube; specimen 2.2 inches across (photograph by T. M. Gathright, II).

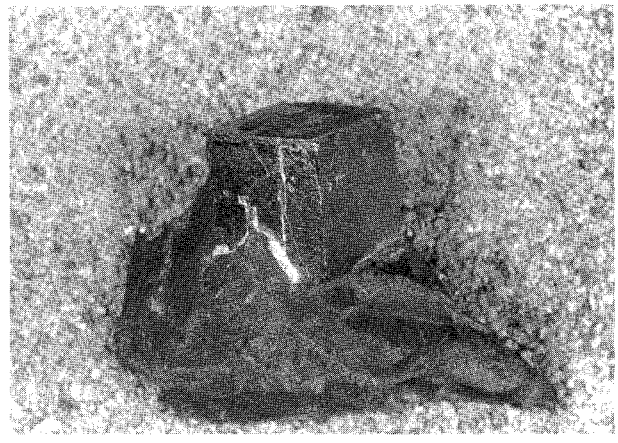

Figure 8. Pyrite cube in limestone. This is the only single cube from the quarry ever seen by the author; cube 0.8 inch across (photograph by D. A. Hubbard).

Some specimens consist of aggregates of crystal forms dominated by the cube (Figure 7). Single cubes are extremely rare. Only one complete cube has been found by the author in many years of collecting at the quarry (Figure 8). Striations on

cube faces are not as pronounced as those on the octahedrons. These striations result from the oscillatory growth between cubic and the octahedral forms.

In addition to well-formed crystals, the pyrite at the quarry also occurs as nodular masses that may be over 1 foot in length. Some are truncated by a cube. These nodular masses are commonly thick in the middle and taper at both ends (Figure 9). Many of these nodules are encircled with a calcite rim. It is not uncommon in the quarry to find pyrite replacing nautiloid shells (Orthoceras). It is not known at this time if all nodular pyrite at the quarry is a result of fossil replacement. Pyrite within the nodules is composed of fine-grained crystalline aggregates and radial fibers.

Pyrite crystals range in color from dark brown in pseudomorphs, found on the surface, to bright yellow at the bottom of the quarry. Other crystals are slightly tarnished to a reddish bronze color. Some of the specimens, particularly the nodular pyrite, are slightly iridescent and display a variety of colors.

Figure 9. Pyrite nodule in limestone (6 inches in length) with calcite border (photograph by H. Freeland).

OTHER MINERALS

Other minerals of interest at the quarry are associated with calcite veins and include the following:

Calcite - Well-formed, clear calcite crystals can be observed in cavities within the calcite veins. Crystals are generally rhombohedral and have a tabular or disk-like habit (Figures 10 and 11). Although small (mostly less than 0.3 inch long), the calcite crystals at Barger's quarry make very attractive matrix specimens.

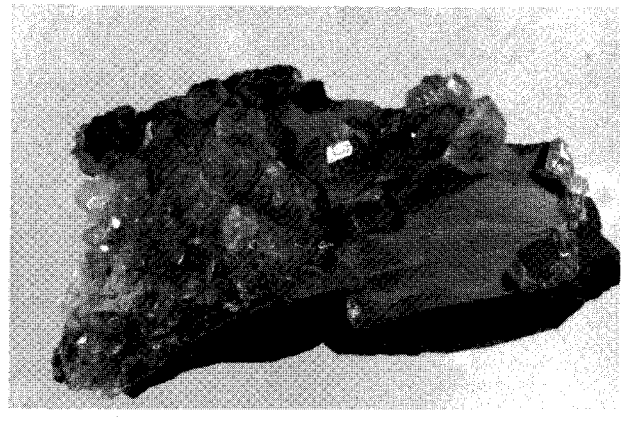

Figure 10. Clear rhombohedral calcite crystals on limestone; specimen 4 inches across, largest crystal 0.2 inches (photograph by H. Freeland).

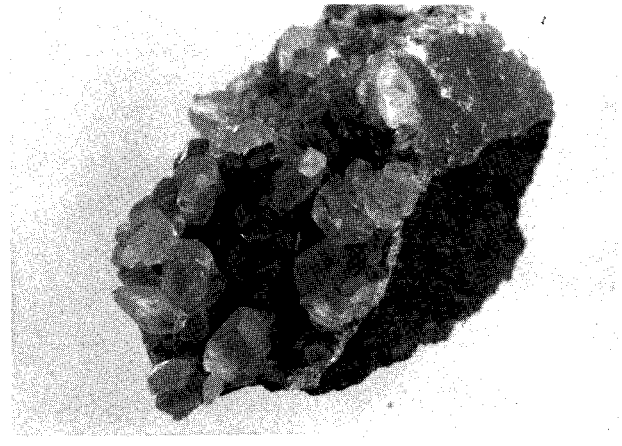

Figure 11. Clear flat rhombohedral calcite crystals on limestone; specimen 3 inches X 2 inches (photograph by H. Freeland).

Fluorite - Purple to pink fluorite crystals as much as 0.25 inch long on the cube edge occur rarely with the calcite. Fluorite also occurs as purple "smears" on slickenside surfaces that result from movement along faults.

Quartz - Clear quartz crystals as much as 1 inch long have been observed in cavities associated with calcite crystals. Some crystals are exceptionally clear and lustrous and crystals with double terminations can be found occasionally.

Barite - Very small (to 0.3 inch) clear tabular barite crystals occur in cavities associated with calcite and quartz crystals. An exceptional barite crystal from the quarry can be seen in the Washington and Lee University mineral collection in Lexington.

GEOLOGY

The rocks in Barger's quarry consist of a sequence of thin- to medium- bedded carbonate rocks within the Liberty Hall Formation. The Liberty Hall is Middle Ordovician in age. Sediments that gave rise to this formation were deposited about 400 million years ago. Within the quarry, the rocks are mostly composed of argillaceous limestone with some shale. Fresh exposures are generally black, and weathered surfaces show a gray color. The beds within the quarry generally strike NE and dip moderately to steeply SE. The structural geology of the rocks in the quarry is relatively complex. Local folds and faults can be easily seen in the quarry walls. Some excellent pyrite crystals are associated with the folded rocks (Figure 12).

SUMMARY

Most of the pyrite at Barger's quarry occurs in a black carboniferous limestone and was probably formed during lithification of the rocks in a reducing environment. Much of the nodular pyrite represents fossil replacement. All other minerals of interest are associated with calcite veins which formed at a later date. Slickenside surfaces are common, especially associated with veins (to 1 foot wide) now filled with calcite.

Access to the quarry may occasionally be gained by contacting Charles W. Barger, Jr. of Lexington. Visitors must sign a liability release form and wear hard hats at all times while in the quarry. Safety glasses are also required while using picks and hammers.

ACKNOWLEDGMENTS

The writer would like to thank Mr. Charles W. Barger, Jr. who kindly granted permission to enter the quarry and has encouraged the writing of this paper. The author would also like to express appreciation to Mr. Randall Nease, longtime Barger employee, who has loaned pyrite crystals for study and to Mr. Herbert L. Grow, Rockbridge County collector, who has provided some of his specimens to be studied and photographed. Mr. Grow has probably the finest collection of pyrite from the quarry and is always happy to show his collection to interested parties. The writer would also like to thank Dr. Richard S. Mitchell of the University of Virginia for his advice and assistance.

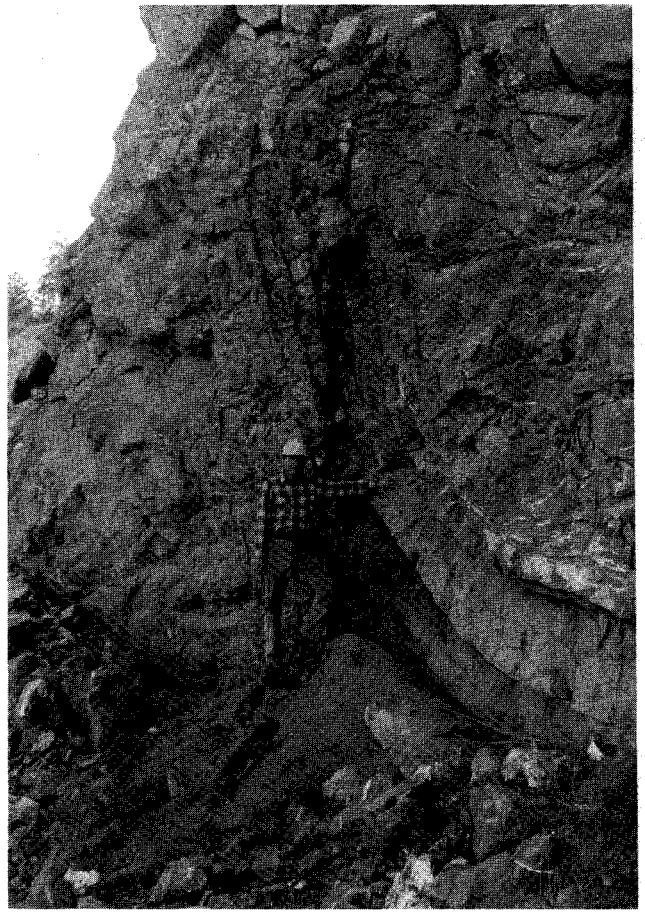

Figure 12. Typical folded rocks in the quarry. Such folds may contain excellent pyrite crystals.

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HIGHEST MOUNTAINS OF THE COMMONWEALTH

Harry W. Webb

Mountain summits are scenic features of Virginia's landscapes. They are important in romantic lore, as well as, being subjects of scientific interest. Often excellent panoramas are visible from their summits. Some hikers have a hobby of walking to the tops of all mountains over a certain elevation.

Virginia has over 60 named mountain summits, each above 4000 feet in elevation. They are located in the Blue Ridge, Valley and Ridge, and Appalachian Plateaus physiographic provinces in the western portion of the Commonwealth. The highest summit, Mt. Rogers at 5729 feet, is named for Virginia's first state geologist, William Barton Rogers. The names of these summits are suggestive of their origin, such as Pine and Red Oak, tree types; Beartown and Elk Pond, animal habitats; Flattop and Double Top, landform shapes; Redrock and Rocky, rock characteristics; and Apple Orchard, agricultural use. The elevations of these features relate to the erosive resistance of the underlying rock and the structural deformation to which the rocks have been subjected. Many of these geological features are described in reports available from the Division of Mineral Resources. A List of Publications is available on request.

The following list of peaks is derived from these shown on 1:24,000-scale topographic maps. Only the highest point (over 4000 feet) of each mountain is selected, even though some mountains have several high peaks. Either, the exact elevation or the highest contour value (+) is indicated. Accessibility by trail or road is indicated by "x". Where access is not shown on the topographic map but on Jefferson or George Washington National Forest maps of 1983 an "(x)" is indicated. Topographic and forest maps are available from the Division of Mineral Resources. An index to topographic maps is available without charge.

	Peak Name	Elevation (feet)	County	Topographic Map	Trail/Road
1	Mt. Rogers	5729	Smyth/Grayson	Whitetop Mtn	
2	Pine Mtn	5526	Grayson	Whitetop Mtn	x
3	Whitetop Mtn	5520+	Washington/Smyth/Grayson	Whitetop Mtn	x
4	Haw Orchard Mtn	5080+	Grayson	Whitetop Mtn	x
5	Beech Mtn	4966	Washington	Konnarock	(x)
6	Bluff Mtn	4840+	Grayson	Whitetop Mtn	
7	Garden Mtn	4710	Tazewell	Hutchinson Rock	
8	Beartown Mtn	4689	Russell	Elk Garden	
9	Buck Mtn, High Rock	4670	Grayson	Middle Fox Creek	x
10	Iron Mtns, Grave Mtn	4640+	Smyth	Whitetop Mtn	x
11	Round Top	4626	Smyth	Whitetop Mtn	x
12	Clinch Mtn	4600+	Tazewell	Hutchinson Rock	
13	Point Lookout Mtn, The Pinnacle	4550	Grayson	Elk Creek	x
14	"Allegheny Mtn"	4546	Highland	Hightown	
15	Flattop Mtn	4528	Smyth	Saltville	x
16	Double Top	4520	Smyth	Whitetop Mtn	x
17	Paddy Knob	4477	Highland/Bath	Paddy Knob	x
18	Great North Mtn, Elliott Knob	4463	Augusta	Elliott Knob	x
19	Knob Mtn, Morris Knob	4440+	Tazewell	Tazewell South	x
20	Snowy Mtn	4400+	Highland	Snowy Mtn	
21	Redrock Mtn	4400+	Smyth	Saltville	
22	Shenandoah Mtn, Reddish Knob	4397	Augusta	Reddish Knob	x
23	Jack Mtn, Riven Rocks	4386	Highland	Monterey	x
24	East River Mtn	4363	Tazewell	Tip Top	
25	Salt Pond Mtn, Bald Knob	4361	Giles	Eggleston	x
26	Slate Springs Mtn, Flagpole Knob	4360+	Rockingham	Brandywine	x
27	Little Bald Knob	4351	Augusta	Palo Alto	x
28	Clinch Mtn Spur	4280+	Russell	Saltville	(x)
29	Rich Mtn, Wynee Peak	4273	Tazewell	Hutchinson Rock	
30	Warm Springs Mtn, Bald Knob	4240+	Bath	Healing Springs	x
31	Red Oak Knob	4229	Highland	Hightown	x
32	Apple Orchard Mtn	4225	Botetourt/Bedford	Arnold Valley	x
33	Mad Sheep	4225	Bath	Sunrise	x

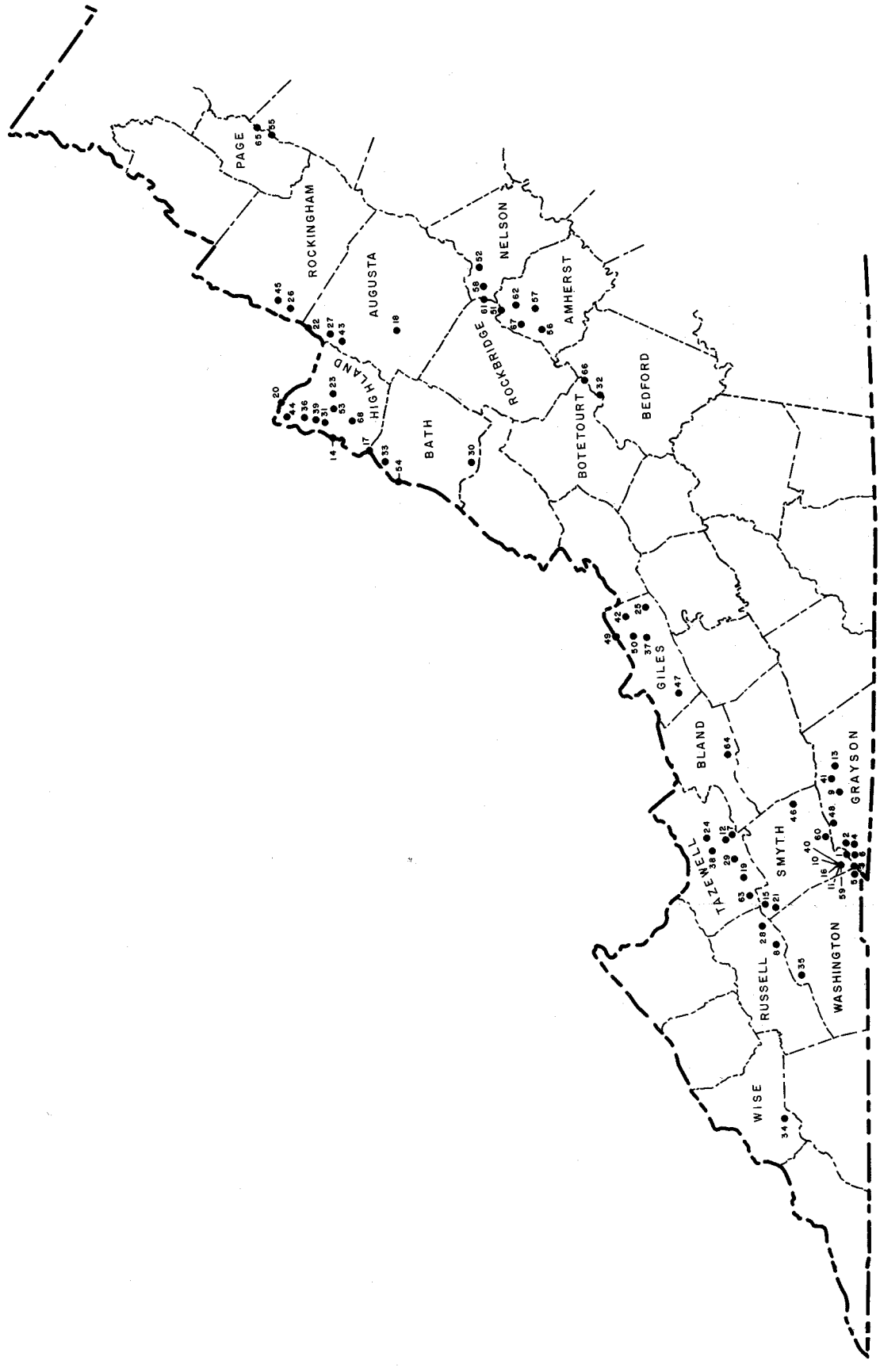

Figure. Location of mountain summits with elevations over 4000 feet.

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	Peak Name	Elevation (feet)	County	Topographic Map	Trail/Road
34	Stone Mtn	4223	Wise	Norton	x
35	Brumley Mtn, Brumley Rim	4221	Washington	Brumley	x
36	Sapling Ridge	4208	Highland	Hightown	x
37	Butt Mtn	4200+	Giles	Eggleston	x
38	Short Mtn	4200+	Tazewell	Tip Top	
39	Bearcamp Knob	4170	Highland	Hightown	x
40	Seng Mtn	4160+	Smyth	Whitetop Mtn	x
41	Big Ridge	4132	Grayson	Elk Creek	
42	Potts Mtn	4128	Giles	Interior	x
43	Big Bald Knob	4120+	Augusta	West Augusta	x
44	Middle Mtn, The Stamp	4115	Highland	Snowy Mtn	x
45	Dundore Mtn	4101	Rockingham	Brandywine	x
46	Glade Mtn	4093	Smyth	Cedar Springs	x
47	Sugar Run Mtn	4087	Giles	White Gate	x
48	Razor Edge	4080+	Grayson	Middle Fox Creek	x
49	Peters Mtn	4073	Giles	Interior	
50	Big Mtn, Brushy Top	4072	Giles	Interior	x
51	Rocky Mtn	4072	Rockbridge/Amherst	Montebello	x
52	The Priest	4063	Nelson	Massies Mill	x
53	Monterey Mtn	4062	Highland	Monterey	
54	Mad Tom	4055	Bath	Sunrise	x
55	Hawksbill	4050	Page/Madison	Big Meadows	x
56	Bald Knob	4040+	Amherst	Forks of Buffalo	x
57	Mt. Pleasant	4040+	Amherst	Forks of Buffalo	x
58	Maintop Mtn	4040+	Nelson	Massies Mill	x
59	Straight Mtn	4040+	Smyth	Konnarock	x
60	High Point	4040+	Smyth	Trout Dale	x
61	Elk Pond Mtn	4034	Rockbridge/Nelson	Montebello	x
62	Pompey Mtn	4032	Amherst	Montebello	(x)
63	Laurel Bed	4020+	Tazewell	Broadford	
64	Walker Mtn	4017	Bland	Bland	x
65	Stony Man	4011	Page/Madison	Old Rag Mtn	x
66	Thunder Hill	4000+	Botetourt/Bedford	Arnold Valley	x
67	Cole Mtn	4000+	Amherst	Montebello	x
68	Back Creek Mtn	4000+	Highland	Mustoe	