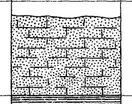
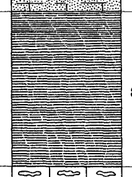
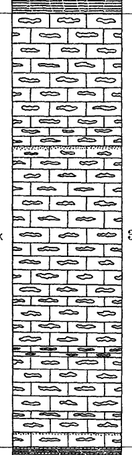
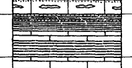
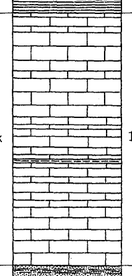
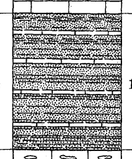
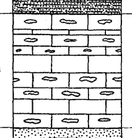
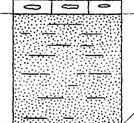
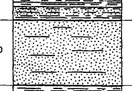
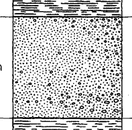
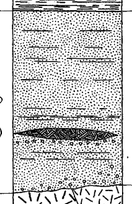
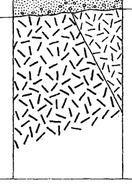
COLUMNAR SECTIONS

GENERALIZED SECTION OF THE SEDIMENTARY ROCKS OF THE ROAN MOUNTAIN QUADRANGLE IN VICINITY OF ERWIN.

SCALE: 1 INCH = 1000 FEET.

System.	Formation Name.	Symbol.	Columnar Section.	Thickness in Feet.	Character of Rocks.	Character of Topography and Soil.
ORDOVICIAN	Tellico sandstone.	Ot		600+	Red and gray calcareous sandstone with seams of limestone conglomerate.	Round knobs. Light sandy soil.
	Athens shale.	Oa		800–1600	Black and bluish-black calcareous shale below, blue-gray banded slaty shale above.	Low, narrow valleys and sharp, steep knobs. Thin, yellow clay soil.
CAMBRIAN ?	Knox dolomite.	€Ok		3000–3700	Magnesian limestone; light and dark blue, white, and gray, with nodules and layers of chert and a few beds of calcareous sandstone.	Broad ridges and irregular rounded hills. Deep, red clay soil mingled with chert.
	Nolichucky shale.	€n		50–600	Yellow, green, and brown calcareous shale with limestone beds.	Steep slopes or narrow, sharp ridges. Thin, yellow clay soil.
	Honaker limestone.	€hk		1800–2200	Massive dark-blue and dark-gray limestone. White and blue limestones.	Open valleys and slopes of knobs. Deep, red clay soil.
	Watauga shale.	€w		1000–1100	Purplish, red, green, and variegated shales, sandy shales, and thin sandstones, with calcareous shales and thin blue limestones interbedded.	Valleys with irregular rounded knobs. Purplish and brown clay soil.
	Shady limestone.	€sh		750–1000	Gray, bluish-gray, mottled-gray, and white limestone, with nodules and masses of chert.	Valleys and low hills. Deep clay soil, dark red and cherty.
	Hesse quartzite	€h		700–1000	Massive white quartzite and sandstone.	High, sharp mountains and ridges. Thin, sandy and rocky soil.
	Murray slate.	€mr		300–400	Bluish-gray to gray argillaceous and sandy shale and slate, with thin sandstone seams.	Depressions and slopes of mountains. Light sandy soil.
	Nebo quartzite.	€nb		200–900	Massive white quartzite and sandstone, coarse and fine, with layers of sandy shale, slate, and reddish sandstone.	High, sharp mountains, with cliffs. Thin, sandy and rocky soil.
	Nichols slate.	€nc		400–700	Bluish-gray to gray argillaceous and sandy shale and slate with thin sandstone layers.	Depressions between mountain crests. Light, sandy soil.
	Cochran conglomerate.	€ch		200–1600	Massive quartzite, sandstone, and conglomerate, white or gray, with seams of dark slate.	High buttes and mountains. Thin, rocky and sandy soils.
	Hiwassee slate.	€hi		300–1500	Bluish-gray to black and banded slates with a little fine mica schist. Includes layers of sandstone and conglomerate.	Slopes of mountains, or low hilly ground. Thin, clayey or sandy soil.
	Snowbird formation. (Amygdaloid.)	€sb (€a)		700–2000	Gray and white feldspathic quartzite and sandstone, with dark slate beds and lentil of amygdaloid. Locally becomes conglomerate and dark-purplish sandstone. Fine quartz conglomerate and arkose at base.	High, irregular mountains and buttes, with round summits. Thin, sandy soil.
ARCHEAN	Granites.				Descriptions given in accompanying table.	Descriptions given in accompanying table.

GENERALIZED SECTION OF THE SEDIMENTARY ROCKS OF THE ROAN MOUNTAIN QUADRANGLE NORTHEAST OF ELIZABETHTON.

SCALE: 1 INCH = 1000 FEET.

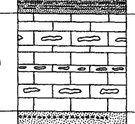
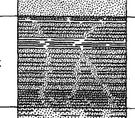
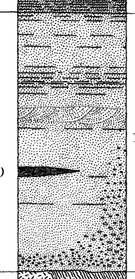
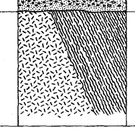
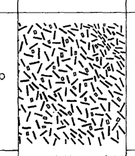
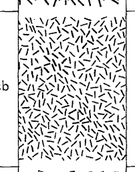
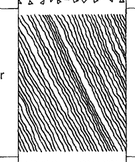
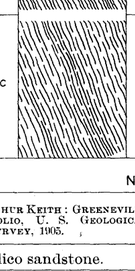
System.	Formation Name.	Symbol.	Columnar Section.	Thickness in Feet.	Character of Rocks.	Character of Topography and Soil.
CAMBRIAN	Watauga shale.	€w		1000–1100	Purplish, reddish-brown, and yellow shales, sandy shales, and thin sandstones, with calcareous shales and thin blue limestones interbedded.	Valleys with irregular rounded knobs. Purplish and brown clay soils.
	Shady limestone	€sh		750–800	Gray, bluish-gray, and mottled-gray limestone, with nodules and masses of black chert.	Smooth, rounded hills and smooth, open valleys. Deep, red clay soil containing chert masses.
	Erwin quartzite.	€e		500–700	Massive white quartzite and sandstone, with thin conglomerate layer near the top.	Mountains with sharp crests, cliffs, and steep, rocky slopes. Thin, sandy soil.
	Hampton shale.	€ht		600–800	Bluish-gray and gray argillaceous and sandy shales with thin sandstone layers.	Narrow depressions and valleys. Thin, sandy clay soil.
	Unicoi formation. (Amygdaloid.)	€u (€a)		1500–2500	Massive white sandstone, feldspathic sandstone, and quartzite, with interbedded shales and sandy shales in the upper part, a thin bed of amygdaloid near the middle, and conglomerate, arkose, and graywacke in the lower part.	High mountains with steep, rocky slopes and lines of cliffs. Light, sandy soil of considerable depth along summits.
ARCHEAN	Gneisses and granites.				Description given in table below.	Description given in table below.

TABLE OF IGNEOUS ROCKS OF THE ROAN MOUNTAIN QUADRANGLE, ARRANGED IN ORDER OF AGE.

System.	Formation Name.	Symbol.	Lithologic Symbol.	Character of Rocks.	Character of Topography and Soil.
ARCHEAN	Beech granite.	Ꝛb		Very coarse biotite granite, massive and schistose, in places coarsely porphyritic; color usually light, but frequently red near the border.	High mountains with broad crests and many ledges and cliffs. Brown, sandy and clayey soils.
	Cranberry granite.	Ꝛcb		Biotite granite and granite-gneiss, coarse and fine; color, light gray, dark gray, and white. Includes dikes of schistose and unaltered diabase, fragments of hornblende gneiss, and dikes of unaltered, fine biotite granite.	High, irregular mountains, peaks, and spurs, with round summits. Red and brown clayey soils with many ledges.
	Soapstone, dunite, and serpentine.	Ꝛs		Dunite, in part serpentinized. Soapstone contains talc and tremolite.	Yellow clay soils, with many ledges and fragments of rocks.
	Roan gneiss.	Ꝛr		Hornblende gneiss and hornblende schist, with some massive and schistose diorite. Includes many beds of mica gneiss, mica schist, and hornblende-mica gneiss, and dikes of altered and unaltered biotite granite.	Broad, massive mountains. Dark-red and brown clay soils.
	Carolina gneiss.	Ꝛc		Interbedded mica gneiss and mica schist, coarse and fine, dark and light gray. Contains many small beds of hornblende gneiss, large bodies of garnet schist and cyanite schist, and dikes of biotite granite, both altered and unaltered.	Ridges, peaks, spurs, and high mountains with irregular crests. Red and brown micaceous and clayey soils.

NAMES OF FORMATIONS.

System.	M. R. Campbell: Estillville Folio, U. S. Geological Survey, 1894.	Arthur Keith: Greeneville Folio, U. S. Geological Survey, 1905.	Names and Symbols used in this Folio.			Arthur Keith: Cranberry Folio, U. S. Geological Survey, 1908.
ORDOVICIAN	Sevier shale.	Tellico sandstone.	Tellico sandstone.		Ot	
		Athens shale.	Athens shale.		Oa	
	Moccasin limestone.	Moccasin limestone.				
	Chickamauga limestone.	Chickamauga limestone.				
CAMBRIAN	Knox dolomite.	Knox dolomite.	Knox dolomite.		€Ok	
	Nolichucky shale.	Nolichucky shale.	Nolichucky shale.		€n	
	Maryville limestone.	Maryville limestone. (Honaker limestone.)	Honaker limestone.		€hk	
	Rogersville shale.	Rogersville shale. (Honaker limestone.)				
	Rutledge limestone.	Rutledge limestone. (Honaker limestone.)				
	Russell formation.	Rome formation. (SEQUENCE BROKEN).	Watauga shale.		€w	Watauga shale.
		Shady limestone.	Shady limestone.		€sh	Shady limestone.
		Hesse quartzite.	Hesse quartzite.	Erwin quartzite.	€h / €e	Erwin quartzite.
		Murray slate.	Murray slate. €mr	Hampton shale.	€ht	Hampton shale.
		Nebo quartzite.	Nebo quartzite. €nb			
		Nichols slate.	Nichols slate. €nc			
		Cochran conglomerate.	Cochran conglomerate. €ch	Unicoi formation.	€u	Unicoi formation
		Hiwassee slate.	Hiwassee slate. €hi			
		Snowbird formation.	Snowbird formation. €sb			
ARCHEAN		Max Patch granite.	Beech granite.		Ꝛb	Beech granite.
		Cranberry granite.	Cranberry granite.		Ꝛcb	Cranberry granite.
			Soapstone, dunite, and serpentine.		Ꝛs	Soapstone.
			Roan gneiss.		Ꝛr	Roan gneiss.
			Carolina gneiss.		Ꝛc	Carolina gneiss.

FIG. 4.—GORGE OF NOLICHUCKY RIVER, 1 MILE WEST OF POPLAR, N. C. LOOKING N. 80° E.

The ruggedness of the channel is caused by hard ledges of Unicoi quartzite. The narrow channel shown in the lower left corner is in strong contrast with the broader stretch shown in fig. 11.

FIG. 5.—ROAN MOUNTAIN, FROM POINT ONE-FOURTH MILE EAST OF ROAN MOUNTAIN STATION, TENN. LOOKING S. 30° W.

The hills in the foreground and the distant spurs of Roan Mountain are composed of Cranberry granite. The broad, rounded summits of the mountains are characteristic of the Roan gneiss. The highest summit is 4,000 feet above Doe River, in the foreground.

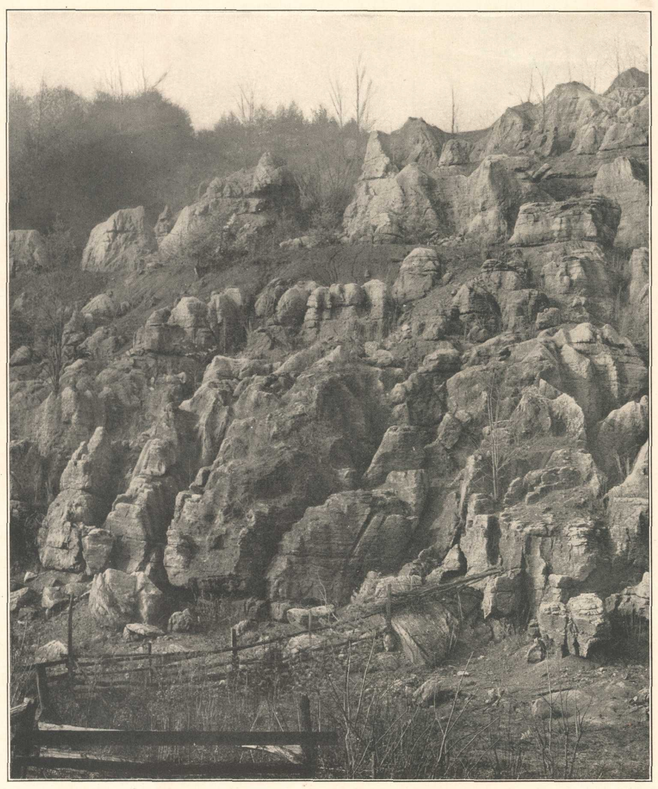


FIG. 6.—LEDGES OF FLAT-LYING SHADY LIMESTONE AT EAST END OF BUMPASS COVE, TENN. LOOKING S. 60° W.

The rock surface has been stripped of its residual clay in mining iron ore. The irregular and deeply channeled surface, due to *solution of the rock, is characteristic* of the decay of limestone formations.

FIG. 7.—GRANITOID GNEISS WITH FOLDED QUARTZOSE LAYERS, 5 MILES EAST OF BIG YELLOW MOUNTAIN.

The quartz layers were added to the granitoid rock before its metamorphism, and show the great crumpling to which the gneisses have been subjected in places. They present marked contrast with the veins in Roan gneiss shown in fig. 8.

FIG. 8.—ROAN GNEISS WITH SECONDARY LENSES OF QUARTZ ALONG THE PLANES OF SCHISTOSITY, 2¼ MILES SOUTH OF TOECANE, ON TOE RIVER.

The gneiss is highly metamorphosed and schistose, while the quartz lenses, which are later, are unmetamorphosed. This parallel foliation is characteristic of the Roan gneiss.

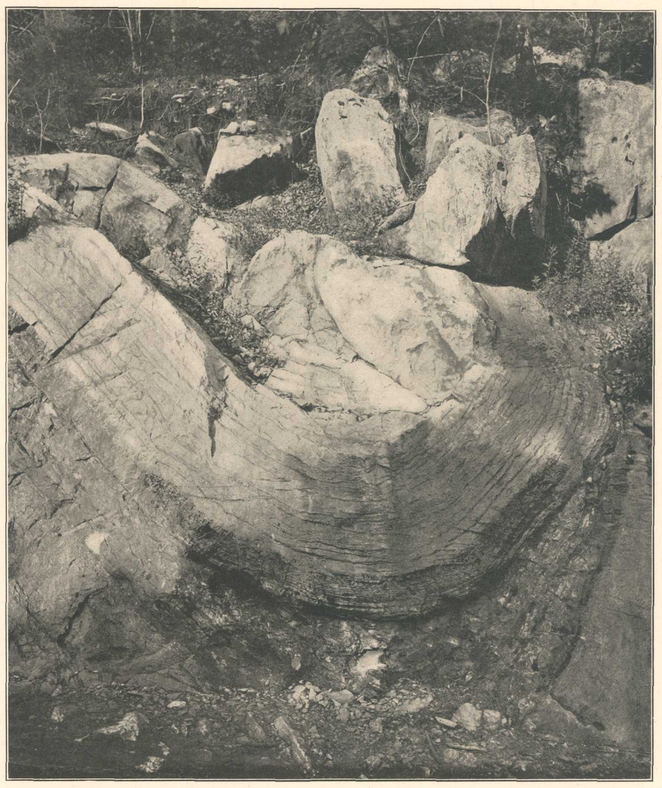


FIG. 9.—CLOSE FOLDING IN MASSIVE BLUE KNOX DOLOMITE ALONG NOLICHUCKY RIVER NORTHEAST OF EMBREEVILLE, TENN.

The great compression during folding is shown by the thinning of the darker lower layers on the steeply upturned side of the fold. Incipient flat shear faults, similar to larger faults in this vicinity, are seen near the base of the fold.

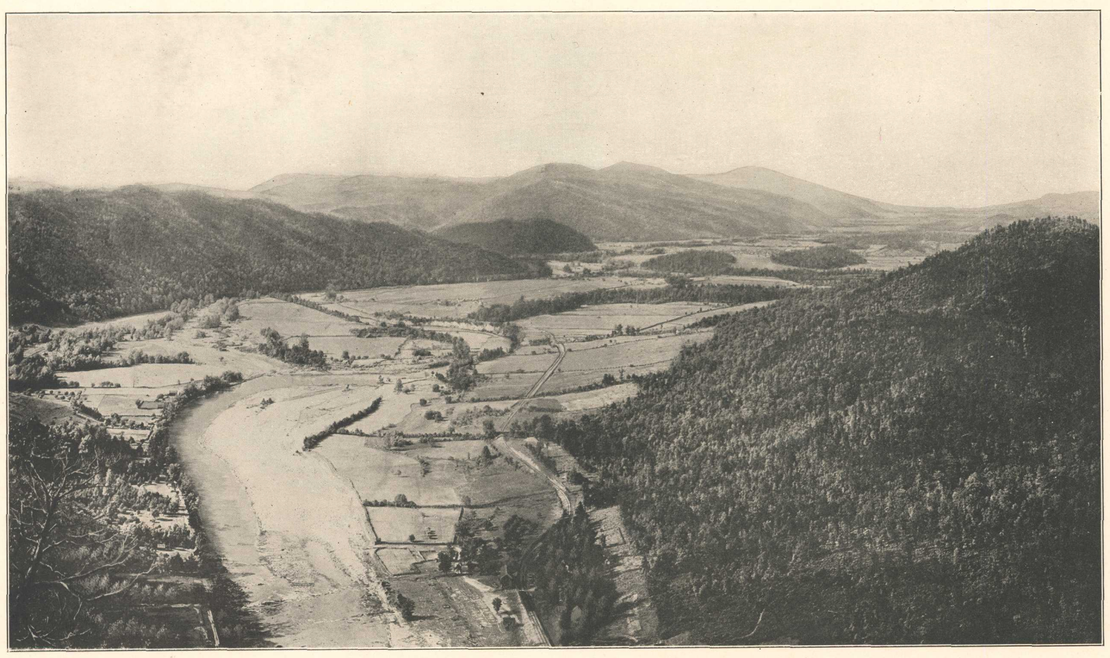


FIG. 10.—EASTERN BORDER OF EAST TENNESSEE VALLEY, ONE-HALF MILE WEST OF UNAKA SPRINGS, TENN. LOOKING N. 30° E.

The flat valley is underlain by the Shady limestone, Watauga shale, and Honaker limestone. The foothills of the Unaka Mountains, on the right, are composed of the uppermost Cambrian quartzites. In the distance, Rich Mountain, on the left, and Buffalo and Cherokee mountains, on the right, are composed of lower Cambrian quartzites, which were thrust forward from their original location, far to the right. They now rest upon younger Cambrian strata, with which they have since been folded and faulted in a general syncline.

FIG. 11.—CANYON OF NOLICHUCKY RIVER, 2 MILES SOUTHEAST OF UNAKA SPRINGS, TENN. LOOKING S. 30° E.

Flattop Mountain and its spurs form the background, and Devils Creek enters from the right in a sharp V-shaped canyon. The cliffs and ledges of Snowbird quartzite are characteristic of this part of the river.

ILLUSTRATIONS II

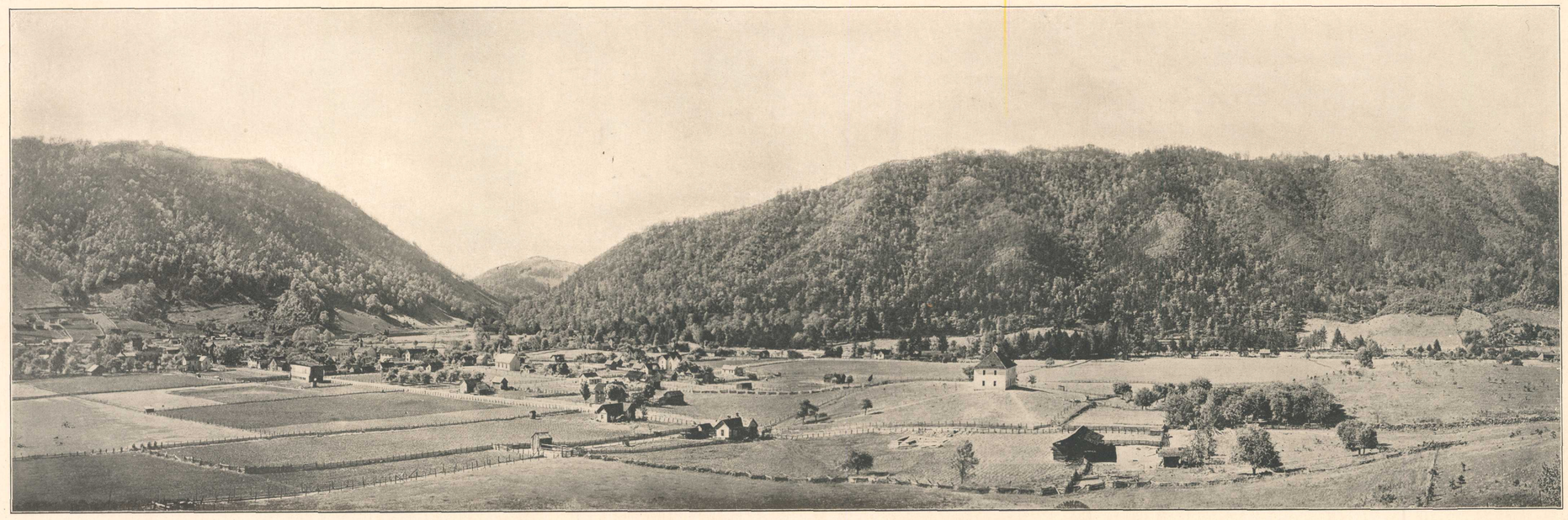


FIG. 12.—DOE RIVER GAP, IN IRON MOUNTAIN, HAMPTON, TENN. LOOKING N. 10° W.

The floor of the valley is covered by gravel and clay overlying Shady limestone. Iron Mountain is formed by the entire Cambrian quartzite series faulted up on top of the Shady limestone. The portion on the left of the gap shows a double crest formed by the Snowbird formation and the Cochran conglomerate, a depression of the Hiwassee slate lying between. The knob seen through the gap is formed by Erwin quartzite.

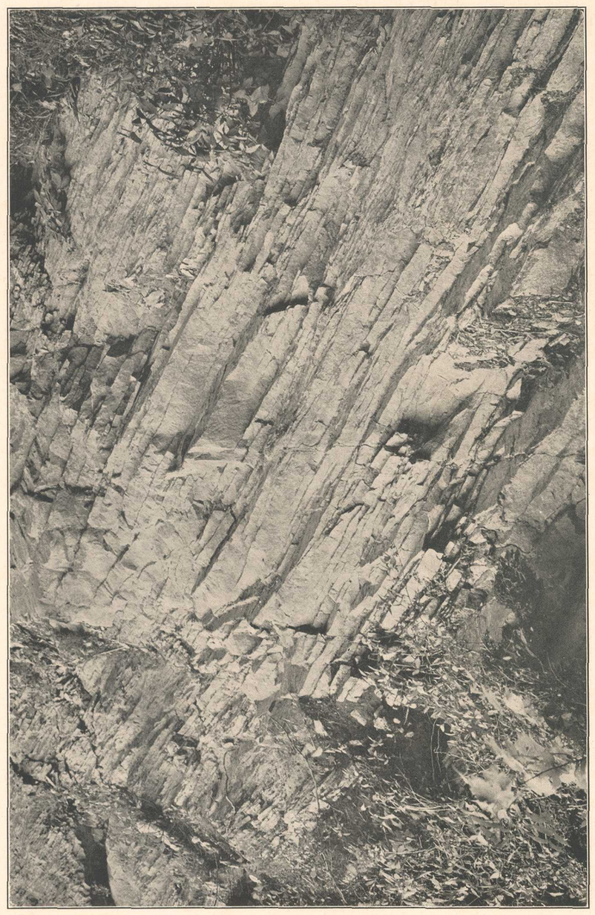


FIG. 13.—HORIZONTAL BEDS OF UNICOI QUARTZITE, STRONGLY JOINTED, ABOUT 1 MILE WEST OF POPLAR, N. C. LOOKING S. 63° W.

This quartzite is feldspathic, strongly jointed, and shows incipient schistosity along the joint planes. The joints are nearly parallel to the great overthrust fault plane farther south and show how the quartzite beds are sheared across by the faults.

FIG. 14.—UPPER PART OF ERWIN QUARTZITE, THREE-FOURTHS OF A MILE EAST OF UNAKA SPRINGS, TENN. LOOKING SOUTHWEST.

The quartzite layers are interbedded with thin layers of slate. The prominent bed is composed of about 20 feet of extremely hard, vitreous, white quartzite, which forms the crests of most of the ridges and covers their slopes with talus. On the extreme right is seen the dark residual clay of the overlying Shady limestone.

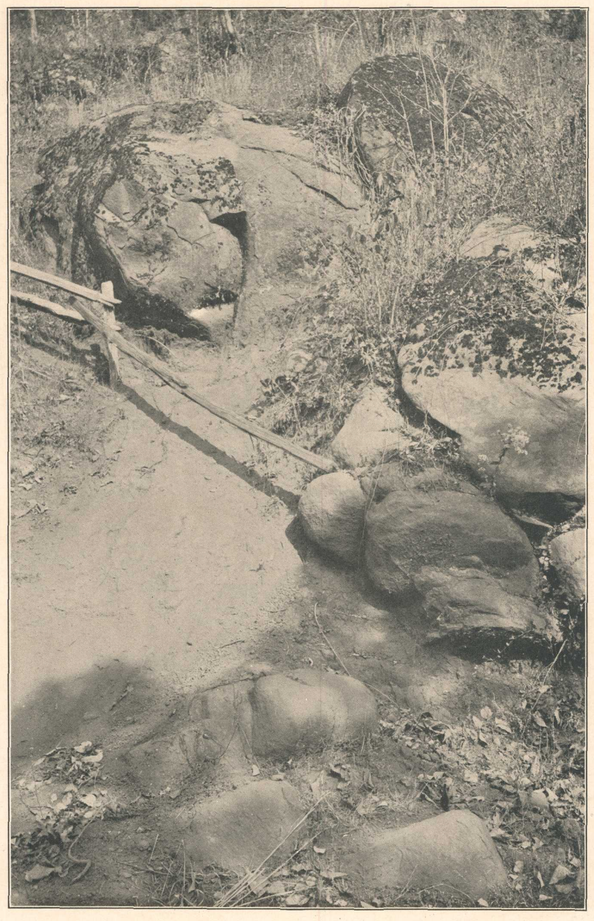


FIG. 15.—CHARACTERISTIC OUTCROP OF GABBRO, ONE-HALF MILE NORTH OF TOECANE, N. C. LOOKING NORTHEAST.

Spheroidal weathering is characteristic of the gabbro in this region, and round bowlders strew its surface. The rock is not metamorphosed and presents a strong contrast to the Roan gneiss, which is of similar composition.

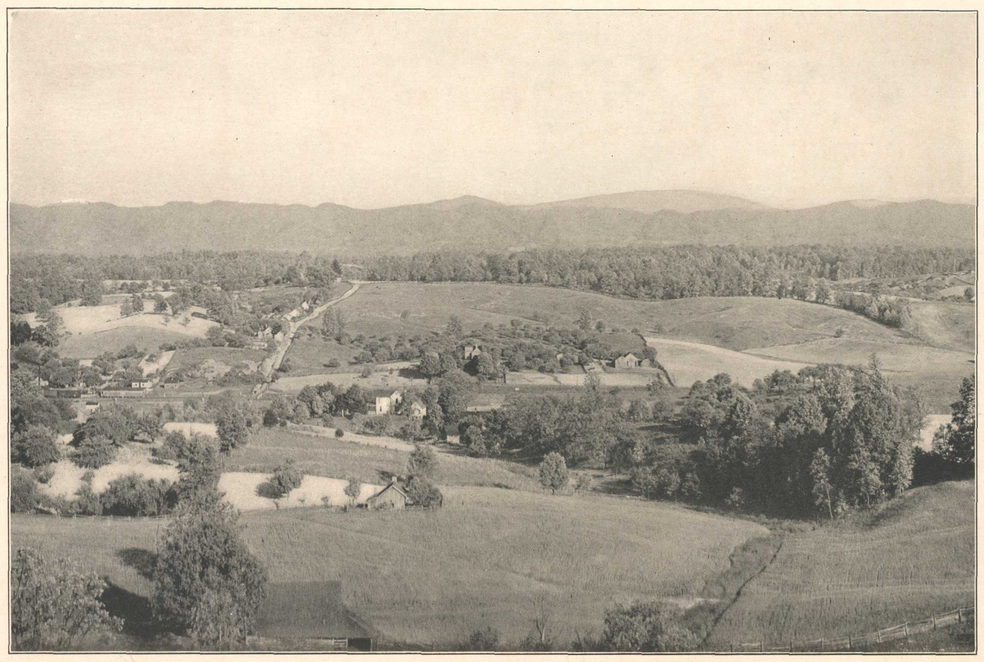


FIG. 16.—VALLEY OF EAST TENNESSEE NEAR JONESBORO. LOOKING SOUTHEAST.

The valley is composed of many rounded hills, characteristic of Knox dolomite, with red clay soil and some chert. The summits rise in general to elevations of 1,700 or 1,800 feet, and are remnants of an ancient plain that extends to the foot of Cherokee Mountain, in the background. This mountain rises abruptly about 1,000 feet above the limestone hills. Beyond, a peak of Buffalo Mountain and the high dome of Unaka Mountain are visible.

FIG. 17.—TOE RIVER AND ITS DISSECTED PLATEAU, 1 MILE NORTHWEST OF TOECANE, N. C. LOOKING S. 70° W.

The point of view is nearly 1,000 feet above the plateau summits, which lie in a plain about 2,600 feet above sea level. The large streams have cut canyons into the plateau 400 to 600 feet deep. Both the plateau and the bordering mountains were worn from a complex mass of granites and gneisses irrespective of their composition and structure.