GEOLOGY OF GIANT CITY PARK*

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Location

Giant City State Park, an area of more than 900 acres in Union and Jackson counties, is located just east and southeast of Makanda, a village seven miles south of Carbondale and about 50 miles north of Cairo. It derives its name from a group of huge blocks of sandstone that occurs in the south part of the park and to which the name "Giant City" has long been locally applied because the arrangement of the blocks resembles city blocks and streets. The park is situated in a belt of hills that crosses the narrow part of southern Illinois and is known both as the Shawneetown Hills because of its geographic relation to the early pioneer town of Shawneetown and as the Illinois Ozarks because it is an eastward extension of the Ozark Mountains in Missouri.

Geologic Origin

Southern Illinois has not always been a hilly country. Ages ago it was a lowland plain slowly emerging from the sea. As the region gradually rose, the streams and their tributaries which flowed upon it cut their valleys deeper and deeper, so that now only more or less isolated ridges and knobs are left. Wherever the rocks are hard and resistant, they stand as steep walls along the valleys; wherever they are soft, they have been worn down to gentle slopes.

Streams

Some of the most striking examples of the results of this stream erosion in hard rock occur in the areas set aside as Giant City Park. The local master stream is Drury Creek, which originates in the vicinity of Cobden and flows north past the west side of the park

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to join Craborchard Creek near Carbondale. The village of Makanda is situated in its valley, and part of its east valley-wall, south of Makanda, is included in the park. All of the northeast area of the park lies along Stonefort Creek, a tributary to Drury Creek, and practically all of the south part of the park lies along another of its tributaries. The walls of these tributary valleys are steep, even abrupt in some places, and are interrupted by steeply-pitching gullies partly filled with coarse debris derived directly from the rock. The principal streams have cut valleys that are more than 250 feet deep below the highest points within the park area. Usually the streams are small and insignificant, but after heavy showers or prolonged rains they rapidly swell to turbulent floods that are capable of moving surprisingly large masses of rock.

Bedrock

Bedrock is generally exposed or thinly covered along the walls and in the side-gullies of the streams. All of this rock belongs to the Pennsylvanian system, so named because rock strata of the same age are well developed and were thoroughly studied in Pennsylvania. They were also known as "Coal Measures" because all of the valuable coal beds in the Central and Appalachian states occur in the system.

The rock that attracts most attention in the park is a massive sandstone formation that composes the upper part of the hills and forms precipitous bluffs wherever conditions are favorable. The huge blocks of rock that constitute "Giant City" are masses of this sandstone formation which have become separated from the adjacent parent ledge. Typical bluffs of it occur on either side of the lower part of the valley of Stonefort Creek, and on one particular outjutting point the natural situation required little artificial improvement to serve as "Stonefort."

Weathering Effects

The sandstone exhibits some interesting features, especially variegated colors and oddly roughened surfaces that result from weathering. A small amount of iron combined with oxygen to form iron oxides is contained in the sandstone and is distributed by groundwater that seeps through the rock. When the iron oxides, sometimes mixed with water to form hydroxides, are deposited or dried they become minerals that range in color from buff through brown and red to black. Consequently on and near surfaces that have been exposed to weathering for some time the sandstone is stained various shades of red, brown, or yellow and may be slightly hardened by the addition of the minerals left by evaporating water, whereas the unweathered sandstone is soft and white or light buff. Sometimes the minerals collect

in pellets or concretions in the rock, and on exposed surfaces these concretions weather out more rapidly than the rock weathers so that a peculiar pitted surface results. Sometimes the concretions are so formed that they include the sandstone grains, and such concretions stand up as knobs on exposed surfaces. The minerals also settle along cracks or whatever courses the groundwater follows and thus serve as a cement binding the sandstone grains firmly together. The sandstone that is thus cemented is more resistant to weathering than is the non-cemented sandstone, so that on exposed surfaces, especially on perpendicular cliff faces, simple to intricately convoluted ridges of iron-cemented sandstone stand out in relief against the less resistant rock and form weird and fanciful designs.

Makanda Formation

This massive sandstone, which attracts the attention of even a casual observer, attains a thickness of more than 100 feet but is only the lower part of what has been named the Makanda formation because it is typically developed in the vicinity of Makanda. Above the massive sandstone lies about 30 feet of gray, blackish, or brown shale which locally contains plant fossils and in which lenticular coal beds as much as three feet thick occur. The uppermost part of the Makanda formation consists of sandstone and sandy shale in thin to medium thick beds, with local lenses of coal. The coal in the Makanda formation is mined locally and several abandoned drift mines are located along the west side of Stonefort Hollow in the east half of the SE. 1/4 sec. 27.

Drury Formation

Below the Makanda formation there is a series of shale, and shaly sandstone beds which are grouped in another formation that has been named the Drury formation because excellent exposures of it occur along Drury Creek, especially in the bluffs south of Makanda. The Drury formation is about 100 feet thick. In the park it is well exposed along Stonefort Creek in the southeast corner of sec. 27; in the slopes, gullies, and vales in the vicinity of "Giant City;" and in the lower parts of the principal gullies along the west side of the park. A wide variety of geologic curios - concretions of many sorts, some resembling organic remains; worm tracks and casts; rill marks; scratches made by vegetation; plant fossils; ripple and current marks; mud-crack casts - may be discovered in the Drury formation.

Lick Creek Formation

Under the Drury formation is another massive sandstone similar to the Makanda formation. It is known as the Lick Creek formation and is named after a cross-roads village about ten miles

southeast of Makanda. The only outcrops of the Lick Creek formation in the park are found in the bottom of the vale northwest of "Giant City" and at the base of the bluffs near Makanda. The formation is only about 100 feet thick near Makanda but farther southeast, beyond the park, it is nearly twice as thick. It is a very resistant formation and forms long, high precipitous walls which stand out prominently in a narrow belt that stretches across southern Illinois.

Older Formations

If a well were drilled in Giant City park it would penetrate a long succession of different rock formations - limestones, shales, and sandstones - which belong to geologic systems older than the Pennsylvanian. Because these formations dip generally northeastward, one after another they come to the surface south and southwest of the park where their character and relations may be studied.*

Geologic History

From the character and succession of the rock formations it is known that time after time during hundreds of millions of years southern Illinois was alternately depressed below and uplifted above sea-level. During the submergences deposits of calcareous ooze, mud, or sand accumulated and were later transformed into limestone, shales, and sandstones respectively. During the emergences the region was exposed to weathering and erosion, so that when it was again submerged, the subsequent deposits lay irregularly, or unconformably, upon the older ones. During the Pennsylvanian period alone there appears to have been about fifty submergences and emergences, but it is believed that since then all of Illinois except a portion of the south end has been a land area continuously, so that streams and other agents of erosion have had ample time to create the topographic conditions that exist at present.

Some of the larger streams have not only cut their valleys down through the bedrock to grade but have also broadened their valleys, and some of the valleys have been partially filled by material washed in by their tributaries. The valley of Drury Creek provides a small-scale but striking example of this process. The level valley-flat lies immediately against perpendicular bluffs - the talus that would be expected at their foot has been washed away and replaced or covered by material washed in from tributaries farther up the valley.

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* Illinois State Geol. Survey Bull. 48, "The Geology and Mineral Resources of the Carbondale Quadrangle," by J. E. Lamar, discusses in detail the geology and an accompanying map shows the distribution of formations in the region around Giant City State Park. Those who are interested may obtain a copy of this bulletin from the State Geological Survey for fifty cents.

Origin of "Giant City"

The huge blocks of rock that constitute "Giant City" strikingly portray the result of a common process associated with valley development. When a stream cuts through a hard rock, such as limestone or massive sandstone, into a softer rock, such as shale, the softer rock is removed faster than the harder rock is, so that the latter is gradually undercut. Eventually it is undercut so far that masses of it break off. It happens that as a result of the numerous up-and-down movements in southern Illinois the hard rocks have been cracked or jointed in many directions. The Makanda sandstone at "Giant City" is jointed along two general directions, and the resulting blocks settle down readily whenever the support provided by the Drury shale below them is reduced. Inasmuch as the shale is soft and "greasy" when wet, the joint-blocks gradually slide down the shale slope and thus move away from the parent ledge. This sliding is assisted by the presence of considerable water that soaks down through the pervious Makanda sandstone until it encounters the less pervious Drury shale and then flows laterally to issue as seeps and springs wherever the contact between the two formations is exposed. The numerous springs in the park owe their origin to this movement of groundwater.

Glaciation

Interestingly enough, Giant City park lies just outside the glaciated area of Illinois. The outermost margin of the only continental glacier (Illinoian) that extended into southern Illinois lies along the north part of Stonefort Creek. Doubtless the park was affected by the proximity of the glacier, but the only visible effect of the glacial, or Pleistocene, period is the deposit of loamy silt or loess that mantles the region. The loess is dust that was picked up from the valley-flats along Mississippi and Ohio rivers and their tributaries, carried far and wide by the wind, and deposited everywhere on the uplands.

The glacier also probably contributed indirectly to the formation of "Giant City." So long as it existed near the park, the snowfall in the region was probably considerably heavier than it is now. The snow would settle in between the sandstone blocks, and as a result of alternate thawing and freezing which would sometimes occur, the blocks would be forced farther apart.