

SAMUEL S. LEWIS STATE PARK, YORK COUNTY

MT. PISGAH AND THE LOWER SUSQUEHANNA VALLEY

Samuel S. Lewis State Park is located in the scenic and historic Upland section of the Piedmont province in eastern York County. The park consists of 75 acres of woodlands, open fields, and rocky ledges on Mt. Pisgah, an 865-foot eminence that overlooks the

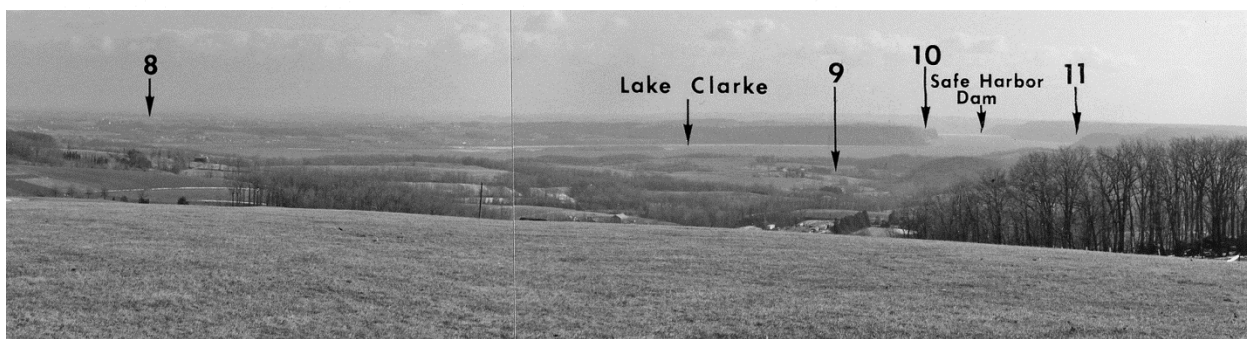
Susquehanna River south of Wrightsville. Because Mt. Pisgah stands at least 500 feet above the adjacent countryside, its summit provides a magnificent panorama of the lower Susquehanna Valley. Although the view from the overlook at the park can be enjoyed on



N
1-Hellam Hills
2-York Valley
3-Chickies Rock
4-Chickies Ridge
5-Chestnut Hill
6-Susquehanna River



7-Manor Hills



8-Conestoga Valley

9-'Conejohela Valley'
10-Turkey Hill
11-Upland gorge

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its own merits without explanation, some understanding of the geologic history and significance of Mt. Pisgah and its surroundings may increase the visitor's enjoyment of the park. The overlook at Samuel S. Lewis State Park is also a good spot to obtain insight into a few of the effects of geology and topography on the economic development of this part of Pennsylvania.

The Overlook

The view from the top of Mt. Pisgah encompasses several hundred square miles of rolling Piedmont landscape to the north, east, and south. Probably the most distant feature visible on a clear day is Governor Dick Hill, an 1,150-foot knob of Triassic-age (190 million years old) diabase, or "traprock." This knob of intrusive igneous rock is near Mt. Gretna, Lebanon County, about 18 miles away. The scenery nearer at hand, however, is entirely developed on complexly folded and faulted, metamorphosed rocks that range in age from Precambrian to Ordovician (600 to 450 million years ago). Except for some volcanic rocks at the bottom of the geologic sequence, these Piedmont rocks were originally sedimentary sandstones, conglomerates, limestones, dolomites, and shales formed from nearshore and shallow marine deposits. The high temperatures and intense pressures of a mountain-building episode approximately 450 million years ago caused recrystallization of the rocks and changed the ones that were shaly into slates, phyllites, and mica schists. Folding and faulting of the rock strata occurred in several stages between 450 and 200 million years ago. After hundreds of millions of years of erosion and intermittent uplift, it is these ancient, highly altered and contorted rocks—once buried beneath several thousand feet of younger rock strata—that form the present landscape.

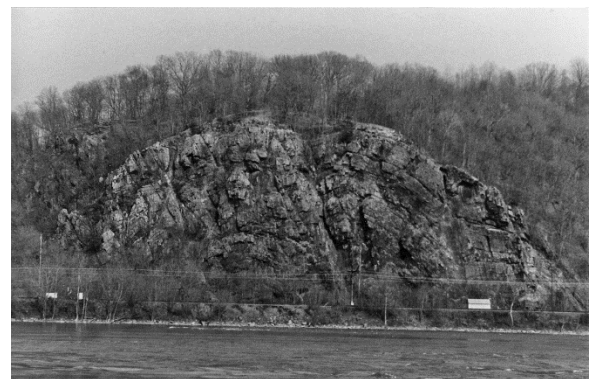
Important geologic, topographic, and cultural features that can be seen from the overlook at the east edge of the park are identified on

the accompanying panoramic photograph. The following discussion of the numbered items starts from the north and moves to the east and south:

(1) The Hellam Hills are a rocky belt of wooded hills developed mainly on upfolded, Cambrian-age (560 million years old) quartzite, phyllite, slate, and conglomerate. In the vicinity of Accomac, older Precambrian (600 million years old) metavolcanic rocks crop out beneath the Cambrian strata.

(2) Between the Hellam Hills and Mt. Pisgah is the York Valley, a one- to two-mile-wide carbonate valley that extends southwestward from the Susquehanna River at Wrightsville through York to Hanover, a distance of approximately 28 miles. The mildly soluble Cambrian- to Ordovician-age limestones and dolomites that underlie the valley are much less resistant to weathering and erosion than the harder, noncarbonate rocks of the adjacent hills. The York Valley carbonate rocks have long been exploited as a source of raw materials for a variety of industrial products, especially cement.

(3) Chickies Rock is an imposing, largely natural promontory of upfolded, Cambrian-age Chickies quartzite on the east side of the Susquehanna River at the upstream end of the water gap that cuts off the Hellam Hills from their extension into Lancaster County. The great arch of the Chickies Rock fold



Chickies Rock
(Note the anticlinal fold in the rock strata.)

(called an “anticline”) rises nearly 200 feet above river level and extends for more than 800 feet along a steep bluff. When the trees are barren of leaves, the fold in the rock can clearly be seen from the overlook on Mt. Pisgah.

(4) Chickies Ridge is a narrow, wooded quartzite (Chickies Formation) hill that continues eastward of Chickies Rock for several miles.

(5) Chestnut Hill, an upland area east of Columbia, is developed on folded and faulted, Cambrian-age quartzites and phyllites (including the Chickies quartzite).

(6) The Susquehanna River has the largest drainage area (27,400 square miles) of any river on the eastern seaboard. The river presumably came into existence as a south-flowing stream about 100 million years ago. Erosion by the Susquehanna and its tributaries since that time is largely responsible for the present configuration of the landscape.

(7) The Manor Hills represent the continuation, east of the Susquehanna River, of the upfolded, northeast-southwest-trending Mt. Pisgah ridge.

(8) The Conestoga Valley is the great carbonate lowland of Lancaster County. It is underlain by Cambrian and Ordovician limestones and dolomites similar to those that form the York Valley.

(9) The “Conejohela Valley” is a complexly downfolded limestone and dolomite valley in the vicinity of East Prospect. Its wide eastern portion adjacent to the Susquehanna River is merely an extension of the Conestoga Valley.

(10) Turkey Hill is a prominent schist hill jutting out from the Lancaster County side of the Susquehanna 5 miles southeast of the park. At this point the river narrows from more than 1.5 miles wide to less than 0.75 mile as it enters the Upland gorge.

(11) The Upland gorge is the narrow, 30-mile-long “canyon” cut by the Susquehanna

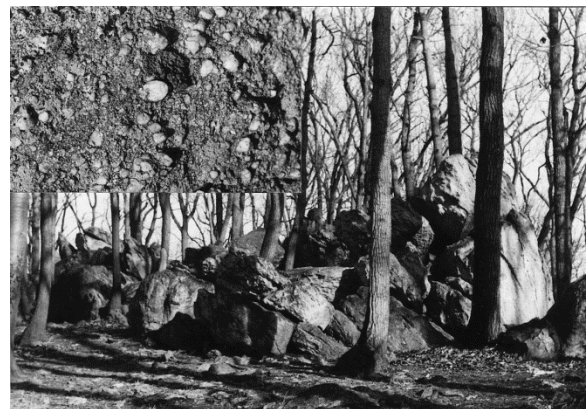
River through the resistant Ordovician(?) -age Wissahickon schist that underlies most of southern York and Lancaster Counties. The relatively uniform level of the hilltops 500 feet above the bottom of the river gorge may represent the eroded remnants of an old land surface formed when the area lay nearer sea level several million years ago.

The Rocks of Mt. Pisgah

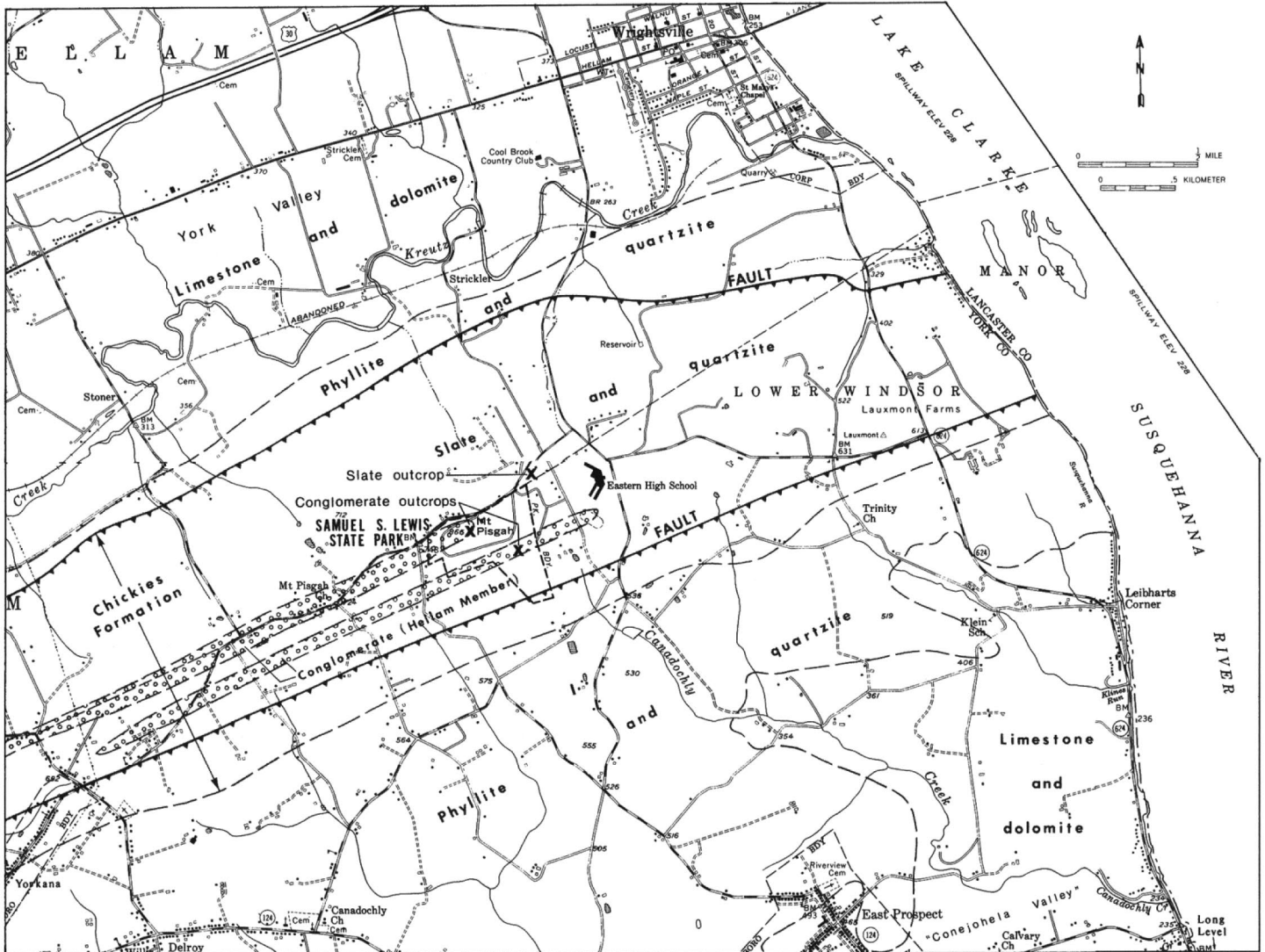
Mt. Pisgah is the high point on a series of prominent hills extending more than 12 miles southwestward from the Susquehanna River. These hills are developed on a broad, fault-bounded and upfolded block of resistant rocks mostly belonging to the Cambrian-age Chickies Formation. South of the York Valley, the bulk of the Chickies is black slate; at the base of the formation is approximately 30 feet of quartz conglomerate known as the Hellam Conglomerate Member. Good exposures of both the Hellam conglomerate and the overlying Chickies slate can be examined in or just outside the park.

Hellam Conglomerate

The Hellam conglomerate is a massive, light-gray, quartz-pebble conglomerate containing pebbles that are generally ½ inch or less in diameter. Some of the pebbles have been flattened and elongated as a result

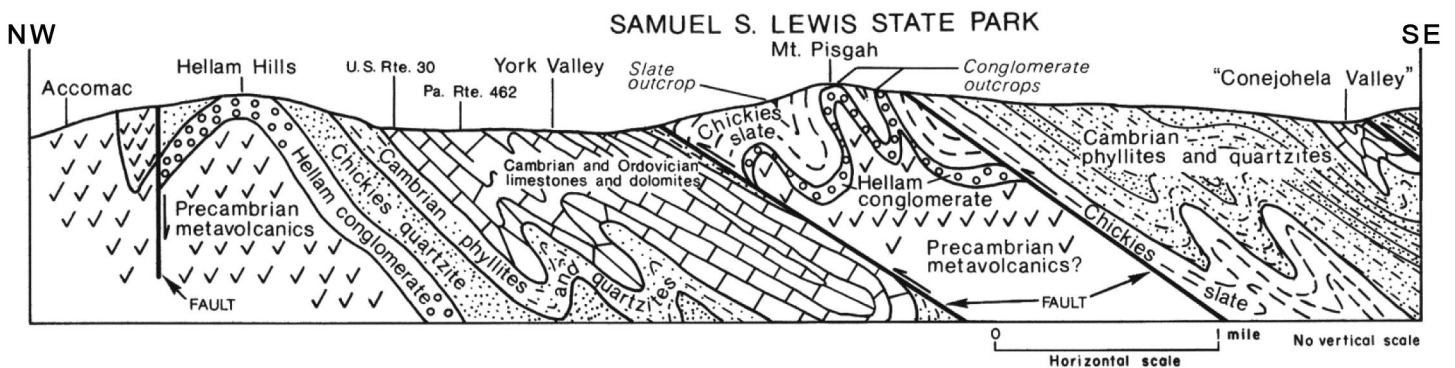


Hellam conglomerate
(Ledges east of the park office. Inset shows close-up of pebbles.)



Geology from Pennsylvania Geological Survey County Report 67, by G. W. Stose and A. I. Jonas (1939).

Geologic Map



Schematic Geologic Cross Section

of intense geologic deformation. Cutting across the rather obscure layering (or bedding) in the conglomerate are many white, glassy quartz veins 1 to 4 inches wide; these veins commonly stand out as projecting ribs on the conglomerate ledges.

Within the park, the Hellam conglomerate crops out as two narrow bands. One lies at the summit of Mt. Pisgah and can easily be traced southwestward through the wooded picnic area. The conglomerate ledges in this band are conspicuously layered, the layers being inclined steeply to the southeast. The second band runs along the south side of the ridge and forms the prominent bouldery crags east of the park office. Each outcropping band of conglomerate apparently occurs at or near the crest of a tightly pinched fold.

The conglomerate is extremely resistant to weathering. Physical breakup of the rock largely results from root-wedging and frost-riving in natural fractures. The jumbled outcrops east of the park office offer striking evidence of the power of these two processes. Root-wedging is particularly effective under present-day, temperate climatic conditions. Under the tundra-like conditions that existed in this area about 15,000 years ago at the end of the Ice Age, the freezing of water and growth of ice in the fractures probably caused the initial splitting of the massive ledges into large, disconnected blocks.

Chickies Slate

The Chickies slate is a dark-gray to black, shiny micaceous slate that contains numerous thin beds of gray quartzite. In sharp contrast to the blocky fragmentation of the Hellam conglomerate, the slate breaks down into much smaller, platy fragments generally less than 0.5 inch thick. An excellent exposure of the Chickies slate is in the deep roadcut on Mt. Pisgah Road about 1,200 feet northeast of the park entrance.

Because it is more easily eroded than the Hellam conglomerate, the Chickies slate tends



Chickies slate
(Roadcut northeast of the park entrance)

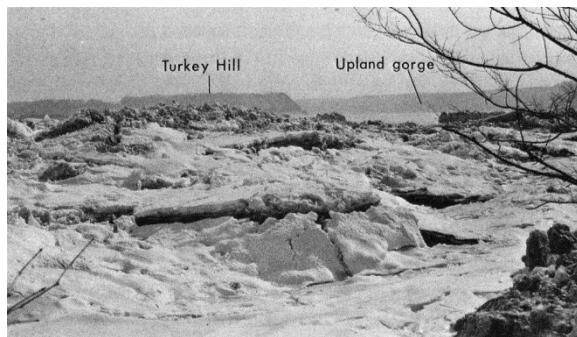
to underlie the slopes and lower summits of the Mt. Pisgah ridge. At the overlook, the sharp drop in elevation eastward from the summit of Mt. Pisgah (conglomerate) to the low hills in the foreground (slate) reflects the difference in erosional resistance of the two rock types.

The Upland Gorge and Hydroelectric Developments

One of the most significant aspects of the Upland gorge is the steep gradient of the river channel throughout its length. From Harrisburg to Turkey Hill, a distance of 35 miles, the river descends at the rate of 2.7 feet per mile. In the 20 miles from Turkey Hill to Conowingo Dam in Maryland, however, the river has a gradient of 7.3 feet per mile, or nearly three times as great. (Dramatically illustrative of the downstream change in gradient is the fact that the nineteenth century Susquehanna and Tidewater Canal required 27 locks to traverse

the first 40 miles north of Havre de Grace, Maryland, and none to complete the final 5 miles to Wrightsville. The flat canal-reach south of Wrightsville became known as the “Five-Mile-Long Level,” now shortened to the familiar Long Level.) The steep gradient in the Upland gorge makes possible the use of the lower Susquehanna for electric power generation.

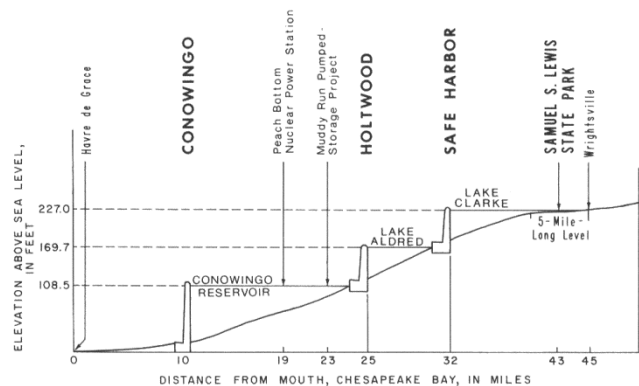
Before the construction of the hydroelectric dams, the lower portion of the Susquehanna was a wild, unpredictable stream. Throughout much of the year, the river course through the gorge was extremely shallow, and rocky islands numbered in the thousands. But in late winter and early spring, the Susquehanna, swollen by snow melt from the mountains, revealed a different character. Tons of ice borne on the river crest crashed through the gorge, carrying away all man-made structures in the way. Numerous wooden bridges were swept off their piers by these floods, and the old canal was damaged many times. Even today ice-jam floods are a frequent occurrence on the lower Susquehanna, particularly because of the constrictions of the river channel at Turkey Hill and Pinnacle Hill, 10 miles farther south.



Upland gorge and ice jam
(Ramparts of ice at Long Level, January 31, 1978)

In the twentieth century, the successive construction of Holtwood (1906), Conowingo (1928), and Safe Harbor (1931) Dams reduced the Susquehanna River in the Upland gorge to a series of slack-water pools (known from

north to south as Lake Clarke, Lake Aldred, and Conowingo Reservoir) connected by short free-flowing reaches. The large Conowingo Reservoir provides a steady source of cooling-water to the Peach Bottom Nuclear Power Station and also serves as a lower reservoir for the Muddy Run Pumped-Storage Project.



Profile of the Susquehanna River in the Upland gorge, showing hydroelectric developments

Coal Dredging in Lake Clarke

Between 1951 and 1973, the Pennsylvania Power and Light Company (PP&L) ran a large anthracite dredging operation on Lake Clarke. The coal was used to supply a new steam generator at the Holtwood power plant. (Particulate anthracite for the Holtwood boilers had previously been obtained from the sediments of Lake Aldred.) Coal and silt were scoured from the bottom of Lake Clarke using floating hydraulic dredges, shipped on barges to shore, and pumped up to a coal-preparation plant on the bluff overlooking the Safe Harbor powerhouse. During its more than 20 years of life, PP&L’s dredging operation reclaimed nearly 10 million tons of coal, at the same time greatly reducing the amount of sediment in Lake Clarke. Late in 1973, the dredges and preparation plant were shut down, because the economically recoverable coal deposits had been exhausted.

The occurrence of large quantities of particulate anthracite in the Susquehanna

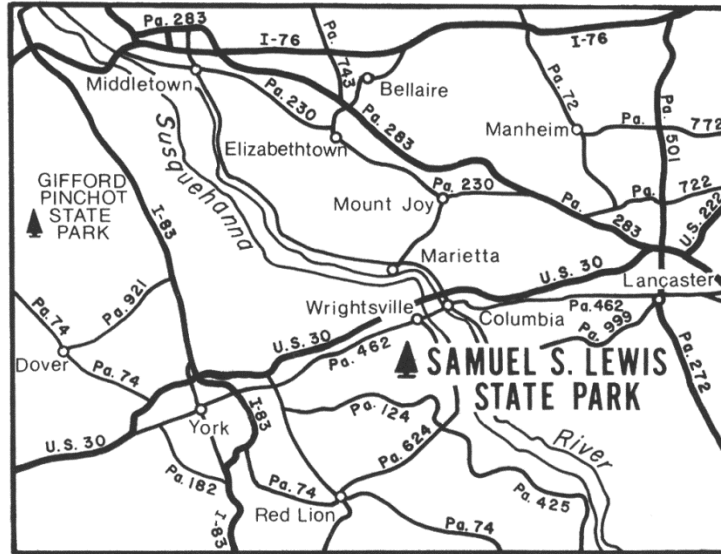


Coal dredge on Lake Clarke
(Photograph compliments of Pennsylvania Power and Light Company)

River sediments is mainly the result of coal-mining activity in the anthracite fields of

northeastern Pennsylvania during the nineteenth century. Because of primitive preparation methods, coal losses to streams were especially severe in the early years of the mining industry. Erosion of culm (waste) banks and direct discharge of breaker water contributed untold millions of tons of coal to the Susquehanna and its tributaries. Since the turn of the century, however, improvements in coal-processing techniques, reclamation of culm banks, and development of markets for the fine sizes of anthracite that were once discarded has largely shut off significant new supplies of particulate anthracite to the Susquehanna and other rivers draining the “hard coal” fields.

—Jon D. Inners, Geologist
Pennsylvania Geological Survey
1983



LOCATION MAP

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*Modified to page-size format in 2012.
Series updated in 2016.*

PREPARED BY

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