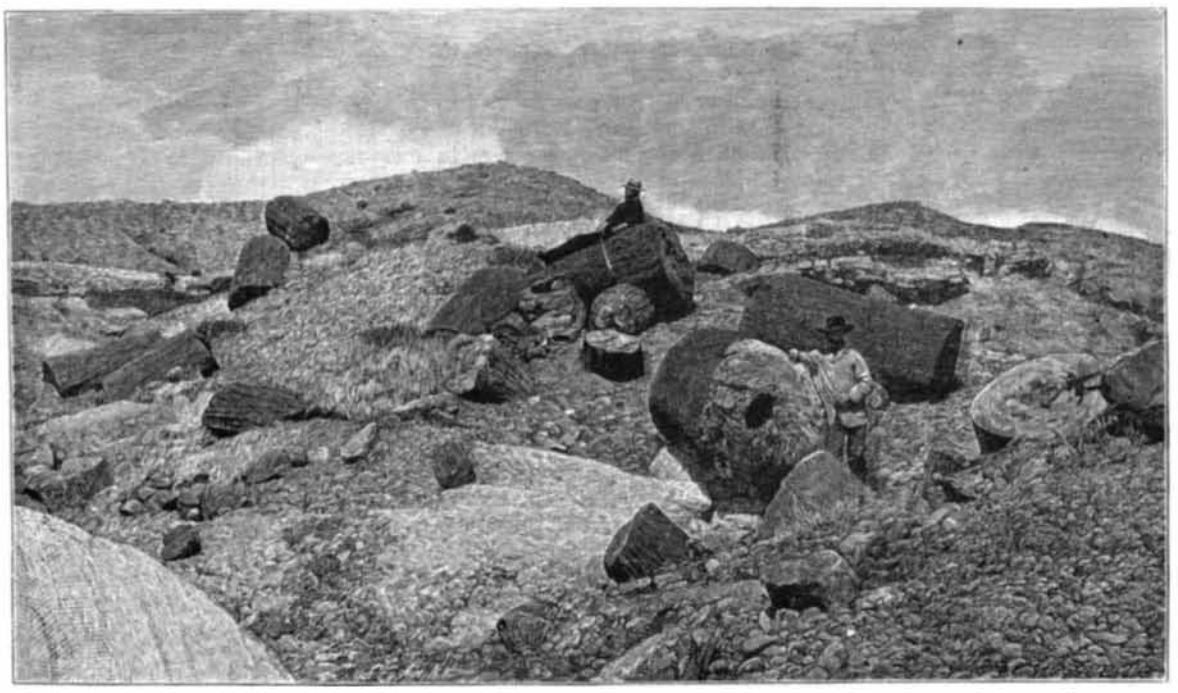
A VISIT TO CHALCEDONY PARK, ARIZONA.

BY H. C. HOVEY.

Twentyyears agoa miner who had been prospecting in Arizona gave me an oblong block of peculiarly marked agate. After letting friends cut off a dozen pairs of sleeve buttons from it, I had the rest of the block polished as a cabinet specimen. It was evidently a kind of petrified wood, and the donor told me that there were immense quantities of it in the region where he had been exploring. That same region is now known as the Chalcedony Park, and was mentioned to me by the railroad officials as being one of the most extraordinary of the many remarkable localities along the Santa Fe route. Holbrook was the place where I was told to leave the cars and take a stage for the park. But there was no stage, and the sand storm that was raging at the time was such as no man who valued his comfort and safety was willing to encounter. Corrizo was somewhat nearer the park, but it was a mere watering station, with no houses nor conveyances. On stating the case to the conductor of the fast California express, he kindly relaxed his rules and stopped his solid train of Pullman cars at "whistling post 233" in the midst of the sage brush, and just at sunset. Pointing to a windmill near the horizon, he said, "That is Adam Hanna's ranch, the only house within ten miles. May be you can get a horse there; and if not, you can foot it in the morning." The train rolled on and left me and my kodak alone in the wilderness.



PETRIFIED LOGS—CHALCEDONY PARK, ARIZONA.

After proceeding for about a mile the banks of an arroya were reached, usually dry as a tinder box, but now flooded by melting snow. The stream seemed to be a moving quicksand, and varied in width from forty to two hundred feet. The ranch was on the other side of the stream; but my halloo brought out the inmates, who directed me to a pile of drift wood, as the only means of crossing. Why Mr. Hanna does not occupy higher ground, near the railroad, and further his own interests, as well as those of tourists, by making regular trips to the park, was a matter not fully made clear.

The next morning, after an exciting episode, being nothing less than an attack on the lady of the ranch by a pair of savage coyotes, I started alone, on horseback, for my destination. It was an easy trail, and the distance did not exceed seven miles. But it was a dreary ride over mesas and arroyas, with occasional glimpses of distant mountains. From the very start the road was lined by specimens of agatized wood equal to the one I had been guarding for so many years. Now and then a petrified log, or solitary stump, were harbingers of what was to be seen further on. The term "park" is a misnomer; for there is no natural park here, nor has the hand of man done anything but to shatter the marvelous relics of dateless antiquity. The people of the vicinity always speak of it as "the Petrified Forest." But that again is misleading; for there is no forest, whatever there may have been fifty centuries ago. It certainly seems as if the place ought to be made a national park, and should be both better protected and more easy of access. As it is, the enchanted spot lies at the mercy of vandals, the only precaution against spoliation being a railroad rule against shipping specimens from it in bulk.

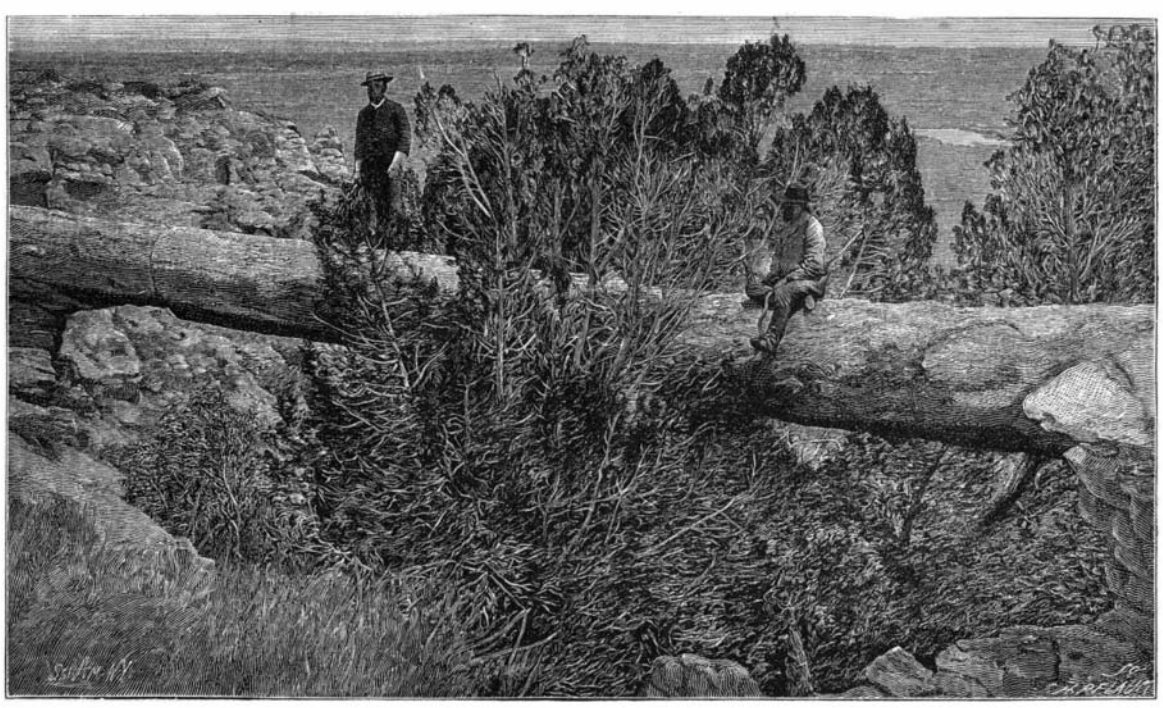
How shall the Chalcedony Park be described? At first one gets the impression that it is a small affair, of perhaps fifty acres. Then he says that it must be a hundred. And after riding over its amazing ruins for many hours in succession, he concludes that the area includes a thousand acres; and finally he hardly questions the bold estimate of Mr. C. F. Lummis that the extensive forest now hardened into stone formerly covered "hundreds of square miles;" and accepts without dissent the assertion of Mr. G. F. Kunz, that there may here be seen at a glance a million tons of precious stones. A matter-of-fact visitor might say that the scene reminded him of a vast logging camp, where the lumbermen had tossed the huge logs from their sleds at random, and then had gone away, leaving them to become rain-soaked and moss-grown. The trees when standing were fully two hundred feet high; for even now their prostrate trunks measure, when unbroken, from one hundred to one hundred and fifty feet. The peculiarity already hinted at is that these mighty trunks are as regularly severed into sections as if the work had been done by a cross-cut saw. The lengths varyfrom disks like cart wheels to logs twenty or thirtyfeet long, or longer. Twigs are found an inch through, and trunks ten feet thick. They lie at every angle; parallel to each other, and at right angles; singly and in great groups; down in gulleys and perched like cannon on hill tops.

And all these myriads of trunks, stumps, logs, branches and tiny twigs are solid stone. And on inspection they prove to be precious gems of almost every known variety. Those that remain intact have been weathered to a dark red, rich brown, or sober black. But Time's relentless ax, aided by the geologist's hammer, has made havoc with so many of them that the ground is thickly strewn with their fragments, from rocks like bowlders down to chips and minute splinters, that show their brilliant colors under the fierce Arizona sun with kaleidoscopic effect. At every footfall you tread on gems, some of which might grace a ducal coronet, while the most plain and least attractive would be worthy of an honored place in the finest cabinet. There are no rubies, sapphires nor diamonds here (as has been incorrectly reported), but the amethyst abounds, and the red and yellow jasper, chalcedony of every hue, the topaz, the onyx, the carnelian, and every imaginable variety of agate. No log, nor fragment, is limited to a single kind of gem. Many are massive mosaics of all the kinds named above. The material breaks pretty easily into cubical forms, but it is extremely hard, and takes a brilliant and durable polish.

Under a magnifying glass the cellular structure is plainly visible, and experts assure us that the ancient forest was made up of trees analogous to our pines and cedars. The region is decidedly volcanic, lava beds and extinct craters being in sight in every direction. Some catastrophe doubtless felled the "forest primeval," which was subsequently buried in volcanic ashes. Floods of hot silicious waters were poured over the ashes, possibly from geysers. The wood became water-soaked, and gradually the silica took its place and shape. The pure silica, as Mr. Kunz suggests, would form the limpid quartz, while the rich colors of red, brown, yellow, and purple would be due to iron and manganese held in solution. I found one block of wood that had changed to solid iron.

Spurring my horse from the valley to the summit of the mesa, mainly formed of light gray sandstone, I followed a trail to its further side, where it is cut by a small canyon about fifty feet deep. And here is the Agate Bridge, the most wonderful object of its kind in existence. This unique bridge is simply a huge trunk spanning the canyon where it is sixty feet wide. The trunk itself is a hundred feet long, and tapers down from a thickness of five feet to a diameter of three feet. Its entire mass is made up of agates, jaspers, and other precious materials. At a point two-thirds of the way across it is fractured, whether naturally or by violence I could not determine. At the bottom of the canyon is a pool resorted to by the cattle of the plains, and around it grow the only living trees to be seen for miles.

The task of selecting specimens from a million tons of gems is less easy than it is agreeable. Each crystal, or moss agate, or amethyst, or onyx, seems most desirable till it lies in your pocket or saddle pouch, and then others assert their superiority. At last my load was as heavy as could be managed on horseback. With reluctance I left the enchanted forest, made my way back to Hanna's ranch, crossed the perilous arroya, flagged an approaching train, gained permission to take my sackful of treasures on board, and sped on my journey, convinced that whatever marvels may have existed in the days of the Arabian Nights' entertainments, none in these more modern times could rival, in its way, the petrified forest of Arizona.



THE AGATE BRIDGE—CHALCEDONY PARK, ARIZONA.

Attempts have been made, to a limited degree, to introduce agatized wood for ornamentation. The material, however, is so extremely hard as to require special machinery for cutting and polishing, and we do not know of any company that has undertaken this work on a large scale except the Drake Company, of Sioux Falls, Dak., specimens of whose work are on exhibition at Tiffany's, in New York City. The largest of these is a block 36 inches in height, 41 × 34 inches diameter, and weighing 2·1 tons. Its entire top is beautifully polished, showing the many kinds of gems of which it is composed. The Indian name for agatized wood is "Chinarump." For centuries the aborigines have resorted to the Petrified Forest for materials from which to make the precious arrow tips so greatly admired by collectors.

THE dynamo is replacing the battery to such an extent in telegraphy that its use will, it is thought, be universal in a few years. It is both cheaper and more efficient.

The Great Suspension Bridge between New York and Brooklyn.

We are indebted to Charles C. Martin, chief engineer and superintendent of the great bridge, for the following:

DETAILS OF CONSTRUCTION.

Construction commenced January 3, 1870.
Size of Brooklyn caisson, 168 × 102 feet.
Size of New York caisson, 172 × 102 feet.
Timber and iron in caisson, 5,253 cubic yards.
Concrete in well holes, chambers, etc., 5,669 cubic feet.
Weight of New York caisson, about 7,000 tons.
Weight of concrete filling, 8,000 tons.
Depth of tower foundation below high water, Brooklyn, 45 feet.
Depth of tower foundation below high water, New York, 78 feet.
Size at high water line—of New York tower, 140 × 59 feet; of Brooklyn tower, 140 × 56 feet.
Size at roof course—of New York tower, 136 × 53 feet; Brooklyn tower, 136 × 50 feet.
Total height of towers above high water, 272 feet.
Brooklyn tower contains 38,214 cubic yards of masonry.
New York tower contains 46,945 cubic yards of masonry.
Size of anchorages at base, 129 × 119 feet.
Size of anchorages at top, 117 × 104 feet.
Height of anchorages, 89 feet front, 85 feet rear.
Weight of each anchor plate, 23 tons.
Length of river span, 1,595 feet 6 inches.
" each land span, 930 feet.
" Brooklyn approach, 971 feet.
" New York approach, 1,562 feet 6 inches.
Total length of bridge, between Park Row and Sands Street curbs, 6,016 feet.
Total length of structure between Center and Concord Street curbs, 6,952 feet 6 inches.
Width of bridge, 85 feet.
Height of roadway at towers, above high water, 119 feet 3 inches.
Height of towers above roadway, 152 feet 9 inches.
Clear height of bridge in center of river span, above high water, at 90° F. temperature, 135 feet.
Grade of roadway, 3¼ feet in 100 feet.
Maximum grade of railway, 3¾ feet in 100 feet.
Number of supporting cables, 4.
First wire was run out May 29, 1877.
Cable making began June 11, 1877.
Diameter of each cable, 15¾ inches.
Length of single wires in cables, 3,579 feet.
Total length of wire in 4 cables, 14,361 miles.
Each cable contains 5,296 parallel, galvanized steel, oil-coated wires, closely wrapped to a solid cylinder.
Weight of wire, nearly 1 pound to 11 feet in length.
Weight of 4 cables, inclusive of wrapping wire, 3,588½ tons.
Ultimate strength of each cable, 12,200 tons.
Bridge opened for pedestrians and vehicles May 24, 1883.
Railway opened to passengers September 24, 1883.
Cost of bridge at completion, exclusive of land, $9,000,000.
Total cost to April 1, 1884, $15,552,878.

DETAILS OF OPERATION.

From opening of railway, September 24, 1883, to January 1, 1892:
One cable-hauling engine, 30 in. diameter, 48 in. stroke. Speed, 70 revolutions per minute.
One cable-hauling engine, 26 in. diameter, 48 in. stroke. Speed, 70 revolutions per minute.
One cable-hauling engine, 22 in. diameter, 36 in. stroke. Speed, 80 revolutions per minute.
Greatest indicated H. P. observed, 1,093·15.
Least indicated H. P. observed, 65·6 negative.
Speed of hauling cable, 10⅓ miles per hour.
Hauling cable, 1½ inches diameter, 12,000 feet long.
" No. 1, used 1,140 days, hauled 22,142,706 ton miles.
" No. 2, used 607 days, hauled 25,492,892 ton miles.
" No. 3, used 393 days, hauled 20,395,073 ton miles.
" No. 4, used 356 days, hauled 18,923,469 ton miles.
" Nos. 5 and 6 are still in use.
Weight of cars—12 cars, 8 tons each, used to March 5, 1887.
" " 12 cars, 10 tons each, used to October 29, 1890.
" " 48 cars, 17 tons each, in use.
" " 12 " 19 " "
Number of cars in service, 60.
Number of cars in use during rush hours, 48.
Largest number of round car trips per day—April 30, 1889—2,159.
Next largest number of round car trips per day—December 31, 1891—2,014.
Total number of round car trips made by cable.....3,477,000=7,388,625 miles.
Total number of round car trips made by locomotives 78,574= 166,970 miles.
Total number of round car trips.....3,555,574=7,555,595 miles.
Each car is moved by cable 2⅛ miles in making one round trip.
Weight of each locomotive, 22 tons.
Number of locomotives in service, 6.
Number of locomotives in use during rush hours, 5.
Shortest headway between trains, 1½ minutes.
Total number of railway passengers carried, 224,077,923.
Total number of railway passengers carried for last 12 months, 39,890,205.
Largest number of railway passengers for one month—October, 1891—3,623,016.
Largest number of railway passengers for one day—April 30, 1889—159,259.
Total number of foot passengers to June 1, 1891, 28,171,839.
Largest number of foot passengers in one month—June, 1883—909,100.
Largest number of foot passengers in one week—the last week in May, 1883—668,456.
Largest number of foot passengers in one day—on May 27, 1883—163,000.

Progress of the Maryland Steel Company.

A correspondent of *Engineering* thus describes the recent visit of the members of the American Institute of Mining Engineers to the above works, at Sparrow's Point, near Baltimore:

This is really a part of the Pennsylvania Steel Company, and bids fair to be the largest part. That company having obtained an interest in the celebrated Juragua mines in Cuba, looked to a location for manufacture on tide water. They accordingly secured 1,000 acres about nine miles from Baltimore, in Chesapeake Bay, and have labored since 1887 to put it into shape, with most gratifying results, for they have probably one of the finest Bessemer works in the United States, while the outlook for the future is even more remarkable. The works have deep-water navigation, which not only brings their ore, but enables them to ship to all coast points and to South America at a minimum expense, and in addition they have constructed a railroad to Baltimore which gives them access to all interior points.

The manufacturing plant at the present time consists of four blast furnaces, of which three have been in operation, and the fourth is ready for work at any time, furnace C being the only one in blast at present; a Bessemer plant and rail mill; the marine department or shipyard, machine shop, pattern shop and foundry, partly completed and in operation. All the buildings and other improvements on the property have been placed here since the Pennsylvania Steel Company commenced operations in 1887.

Of the piers, No. 1, 40 ft. wide and 600 ft. long, was built in 1887; No. 2, finished in 1890, is 900 ft. long and 100 ft. wide. These piers, which will accommodate six steamers, are designed chiefly for the handling of cargoes of iron ore and for shipping the products of the works; they will be equipped with the most approved appliances for this work.

The four furnaces now built are each 85 ft. high and 22 ft. bosh. The blast is supplied by double vertical condensing engines, built from designs of the company. The blowing cylinders are 84 in. in diameter and 60 in. stroke, and steam is supplied by Babcock and Wilcox boilers, 4,000 horse power being allowed each pair of furnaces. There are four Whitwell stoves, 70 ft. high and 22 ft. in diameter, for the hot blast to each furnace.

The Bessemer plant is arranged to work either with direct metal from the blast furnace or with remelted metal from the cupolas, and is designed for four 18-ton converters. Along the line of the stock house electric cars are run on a depressed track to convey the stock barrows to the hoist, thus saving the labor of wheeling. A casting was made while the party was there. The moulds were placed in vertical position on cars specially designed for the purpose, and the ladle is hung over the cars, which are moved mechanically under it to be filled; hence a pit is not required, which seems a great improvement. The ingots are stripped by a double vertical stripper and taken to two blocks of pit-heating furnaces.

The blooming mill is of the "two-high" reversing type, with rolls 36 in. in diameter, driven by a pair of 42 in. by 60 in. reversing engines. Beyond the rolls is a hydraulic shear for cutting off the ends of the blooms. The blooms pass direct from the blooming mill table through the shear to the rail train, where they are rolled into rails without reheating.

The rail train is "three-high," with rolls 26 in. in diameter, driven by two 48 in. by 66 in. Porter-Allen engines. One engine will drive this in case less power is needed, and the train is fitted with tables for handling the bars from the different passes mechanically, and is arranged for turning out finished rails six lengths (180 ft.) each. The six-length rails are rolled on the lighter sections, the number of lengths being reduced as the weight of the section increases. The object is to keep the weight of the ingots uniform, Beyond the rail train are the sawing, straightening and drilling appliances.

In cooling, the rails do not touch each other. Hence there is little straightening required. In fact, one is impressed with the many devices to facilitate the work and to reduce the handling of the material to a minimum.

On that portion of the property lying east of the Bessemer and rail department an extensive plant of open-hearth furnaces is projected, the product of which will be distributed among the blooming mills, plate and structural shape mills to be erected in connection with them.

The marine department, although not complete in its varied details, is in active operation. On the fitting-out pier, alongside which vessels will be taken as soon as launched, to receive their machinery and outfit, is being erected a machine shop, also hoisting shears of 100 tons capacity. The other buildings comprise the tool shed, smith and machine shop, joiner and paint shop, and dry house. There are now completed four slips for vessels 250 ft. to 300 ft. long, others for larger vessels to be added as required. One steel seagoing tugboat has been recently completed and is now in active service; another is nearly finished. A side wheel steamer 210 ft. long and a propeller steamboat 305 ft. long, for the service of the Baltimore Steam Packet Company between Baltimore and Norfolk, are under way.

The machine shops, one section of which is now erected and partly in operation, are intended to produce the apparatus required for the extension of the manufacturing plant and the engines and other machinery required by the shipbuilding department. The present shop is one of three bays, of which the other two will be used as erecting and light tool shops.

In this building heavy castings for the works and for the vessels at the shipyards are being made daily and handled by hydraulic cranes, to be aided by a 50-ton electric traveling crane which is nearly completed.

A brick manufactory with a daily capacity of 25,000 is operated by this company, and on the property is located a lumber company manufacturing 250,000 ft. per day. The buildings have been constructed with a view to extension, and reflect the greatest credit on their designers. This inspection closed the day's excursion, and there was yet another trip to be chronicled, and that was to Indian Head on the day following, to see the United States proving grounds, to witness some tests. Shots were fired from the rapid-fire guns and from the 6-in. and 8-in. rifles. The 6-in. shot passed through a Carnegie 6-in. plate. The smokeless and cocoa powders were examined, and from thence the party visited the United States Navy Yard at Washington, to see the gun shops, and to admire the lathes and rifling machines for guns from 6 in. to 12 in. These guns were shown in various stages of completion, and the heart of the American citizen dilated with pride, and he felt almost like wishing for a war to show foreigners what an American gun can do when needed.

The arrangements for this meeting, it may be said in closing, were most carefully planned and completely carried out. The local committee covered themselves with credit and deserved all the thanks they received.

Their souvenir book giving an account of Baltimore, its industries, its geological characteristics, and accompanied by an excellent map of the city and a geological map of the section, was a work of care and was greatly appreciated. It will, undoubtedly, find a permanent place in the libraries of the members, and remind them that the Baltimore committee are men to be proud of.

A Kingdom in Ohio.

Zoar, O., is the abiding place of a mystic band of German communists who hold all property in common, the place being a miniature kingdom within itself. The people, who call themselves Zoarites, own 7,000 acres of land, which all lies in one body, about half of the tract being in a high state of cultivation. The original Zoarite purchase was 10,000 acres, but 3,000 have since been sold at a high figure. Every article, implement, device, contrivance or machine used, wrought with or employed in Zoar, is of Zoarite manufacture, and the same may be said of every article worn or eaten, with the exceptions of coffee, tea and spices.

The shoes the Zoarites wear are made by their own shoemakers from leather prepared by their own tanners, from hides taken from cattle bred and raised on the great community cattle farm. The coal which warms them and cooks their food is dug from their own mines, and is burned in stoves cast in their own foundry from iron smelted in their own furnaces from ore found in abundance on their own lands. They have community tailors, bakers, weavers, butter makers, cheese makers, and all other useful artisans and tradesmen. The tailor uses nothing but Zoarite cloth made by the Zoarite weaver from wool sheared from Zoarite sheep. The same may be said of the whole catalogue of manufactures, which certainly gives to Zoar distinctive characteristics unknown to any other American city or community.—*St. Louis Republic.*