

PERMANENT PICTURES ON THE RETINA.

Immediately after the discovery of the visual purple by Professor Boll, and the ascertainment of the fact that it is possible to produce pictures on the retina which can be examined after the death of the animal, the question was discussed as to whether these pictures could be made use of by the legal profession in cases of murder, etc. Dr. W. C. Ayres, who has made more than a thousand experiments in the laboratory of Professor Kühne, at Heidelberg, in obtaining optograms on the retina of animals, has an article in the *New York Medical Journal*, in which he answers the question negatively.

After explaining the photo-chemistry of the retina and describing the *modus operandi* of obtaining optograms in the eye of the living animal, Dr. Ayres goes on to state that while he was working in the laboratory at Heidelberg, Professor Kühne proposed that he should make a picture of Helmholtz and send it to the latter as an acknowledgment of the value of his researches in physiological optics. Dr. Ayres, therefore, provided himself with a large negative of Helmholtz and set about making an optogram from it, according to the most approved methods. The negative was placed over the eye, which had been dosed with atropine. The animal was in the dark room for hours. The sun was shining brightly, so that there was the best of light; and every precaution having been taken, the retina was exposed for four minutes. There was a dull picture on the cornea, and when the retina was examined there was found an image of Helmholtz's shirt collar and of the end of his nose. The light was not bright enough, or rather there was not enough transmitted through the negative to bleach the visual purple. As there is always an active rhodogenesis in the living retina, and it might have been strong enough in this case to restore the visual purple as fast as it was bleached, Dr. Ayres cut off the head of a rabbit and waited until all such power on the part of the retina was certainly done away with, and then repeated the experiment. The result was a little better than the preceding, but the optogram was by no means sufficiently distinct for one to recognize even that it was intended for a picture. Dr. Ayres, therefore, came to the conclusion that such an optogram was impossible and gave up the plan.

In conclusion, he adds that since the above-described experiment failed so signally, he believes it utterly idle to look for the picture of a man's face, or of the surroundings, on the retina of a person who has met with a sudden death, even under the most favorable circumstances.

PICKETT'S CAVE.

BY H. C. HOVEY.

Every one who visits Colorado is surprised at certain features of scenery, to be accounted for only by considering the peculiar geological structure of the region.

The vast plains, sweeping from the Missouri Valley westward to the foot-hills of the Rocky Mountains, have a gradual upward slope from an altitude of only 770 feet above the sea, at Kansas City, to an elevation of 6,000 feet, at Colorado Springs. The underlying rocks, resting on one another in broad sheets, are varieties of sandstone, limestone, slate, and shale, mostly belonging to the cretaceous formation.

A glance at the geological map of Colorado shows that large areas of the mountain region are marked as "eruptive," which means that, at some period later than the formation of the plains, there was a great upheaval of the earth's crust, causing the lower rocks to appear at the surface, sometimes by volcanic violence, and at others by the slower process of denudation. These rocks are granite, gneiss, trap, and other hard species, capable of resisting the ordinary action of the elements.

Along the border line, between the plains and the mountains, is a comparatively narrow but highly interesting region, lying nearly north and south, where the rocks of the plains, instead of being flat, are turned upward and broken off by the same force that lifted the mountains themselves. It is the opinion of the geologists that these sedimentary beds once extended much further up the mountain sides than now, being gradually worn down by the retreating waters of the primeval ocean, and the subsequent erosion by running streams.

One of my summer vacations, not long ago, was spent amid the mazes of this border land, and I found it a geological paradise, where the explorer may, by guiding his course intelligently, cross the edges of all the strata, from the Archæan rocks to the Tertiary, studying the entire history of their folding and erosion, to better advantage perhaps than anywhere else on the continent.

The Monument Group of red sandstones has been repeatedly described by pen and pencil. The fanciful columns of loosely cemented sandstone, each capped by a layer of tough ironstone, that are, in Monument Park, only 10 or 20 feet high, rise to lofty castellated forms in the Garden of the Gods and Glen Eyrie, some of the needle-like spires shooting 300 feet above the green meadows at their base. These grotesque pillars are produced not only by the flowing water, but by the cutting action of whirling sand blown about them by the dry winds of summer.

Frequently, instead of standing in isolated masses, the red sandstone runs in ribs parallel to the chain of adjacent hills. These ridges are cut through at intervals, by arches, gateways, caves, and tunnels, with very picturesque effect.

The width of this border region varies from one to twelve miles. Nearest the Granite Hills its rocks seem to have been

sufficiently modified by heat to acquire an obscure columnar structure, thus opening lines of weakness, which have been sought out by the water, aided by insinuating roots and the power of frost, until one columnar mass after another has been pried off and finally removed by the further action of the elements. This process results in a deep and narrow valley known as a *cañon*.

Hundreds of cañons are found in various parts of the Rocky Mountain region, some of which are of enormous dimensions. But those visited by me lie along the course of Fountain Creek, at the base of Pike's Peak, and are interesting, aside from their wonderful scenery, because affording such an excellent opportunity to examine not less than 4,000 feet of sedimentary rocks. In many of them the torrent had plowed down into the underlying feldspathic granite, giving an amazing exhibition of aqueous energy.

Williams' Cañon, near Manitou, was the last one visited, and on some accounts I found it the most interesting of all.

The mouth of this cañon is cut through the red sandstone to a limestone, at first yellowish and sandy, but improving in quality as one goes deeper into the gorge, until it is of a good quality for all purposes to which limestone is ordinarily put, and large quarries have been opened, to which a wagon road leads.

The walls rise for 400 or 500 feet on each side, in many places absolutely perpendicular, and sometimes so close to each other that both wheels of the lime carts would graze the walls in passing.

I found but few fossils, and they seemed to belong to the Silurian formation; a conclusion verified by Hayden's report, which speaks of these beds as being decidedly referable to the Silurian group. Professor Hayden adds: "I have never known of any Carboniferous fossils being found here, but am confident that there are 1,000 to 1,500 feet of these beds between the Silurian and Triassic."

On his geological map, 1876, he assigns a portion of these rocks to the Carboniferous, and also marks high ridges of Silurian limestones on the side of the mountain about four miles north.

The existence of heavy deposits of nearly homogeneous limestone under circumstances so favorable for excavation excited my curiosity as to the existence of caves in that locality. But after following the cañon for two miles or more, toward its head, nothing of the sort presented itself, except an open gorge, to which visitors had given the name of "The Cave of the Winds."

An entrance was discovered, last June, through this very gorge to a cavern of large dimensions, named for the boys who found it, *Pickett's Cave*, and described by Rev. R. T. Cross in the *Congregational News* for March, 1881.

Some progress in underground research was made last fall by an organization known as "The Boys' Exploring Association," of which the young Picketts are members. They found numerous obstructions, but noticed in one of the rooms entered a peculiar chimney-like aperture nearly closed by dripstone.

Through this chimney a passage was forced, last January, by Messrs. Reinhart and Snyder, who now own the cave. They found at its upper end a spacious hall about 200 feet long, decorated with a profusion of stalactitic formations, in some instances translucent and in others varying in color from red to pure white, sometimes coated by delicate frost-work.

A canopy was observed on one side of this hall perforated by the rotary action of water, near which was a pit partly filled, on whose sides there were singular markings caused by calcareous deposit from the evaporation of water.

Crawling for thirty feet through an "auger-hole," admittance was gained to a series of rooms containing many curious and beautiful objects, including a set of *musical stalactites*!

Through a deep pit they descended by means of a rope into other apartments; while to reach others still they had to climb steep acclivities, or worm their way through passages nearly filled by *débris* or obliterated by dripstone.

Forty rooms in all have thus far been explored; and according to the account given the attractions increase as exploration penetrates the mountain side. Shining crystals, tufts of satiny fiber, slender arms mimicking growths of coral, rams' horns twisted and intertwined in every conceivable way, pillars and pendants, statuettes and grotesque resemblances of life, are among the charms of these enchanted halls.

Vandals have, of course, despoiled the rooms first opened, and the discoverers had a right to take a few choice specimens to be placed in college cabinets, where they could be seen by the public. But now we are pleased to see that the rules forbid any one's taking specimens, or even entering unaccompanied by a guide.

It is stated that "after entering the cave it takes about two miles of travel to explore every part of it." But the proprietors are building stairways and enlarging the narrow places, so as to enable visitors to go the round without serious fatigue. They promise also to improve the wagon road to a point near the cave, and to make steps up the wall of the cañon, to facilitate the ascent of nearly 200 feet that has to be made at an angle of 40° to gain the entrance to this subterranean realm.

If Pickett's Cave is, as I infer, excavated from Silurian limestone, that it itself is a remarkable circumstance; for some of the most celebrated geologists in America have recently expressed "grave doubts whether in a single case Silurian caves extend much beyond the light of day." I have, in previous articles in the *SCIENTIFIC AMERICAN*, referred to

Hanover Cave, a mile and a half long, and Howe's Cave, three miles long—both of them Silurian caves; and now we may add Pickett's Cave, said to be two miles in length.

It must be admitted that such cases are exceptional, the rule being that most Silurian caves, at least such as I have examined, are considerably wider at their entrance than at any point within.

It also remains to be ascertained if Pickett's Cave really is in Silurian rocks, or pierces through to the Carboniferous formation famous the world over for its cavernous structure.

Further particulars may hereafter be given as new discoveries are made. But it cannot be doubted that one more great attraction is added to the wonderful region that boasts of Monument Park, Glen Eyrie, the Garden of the Gods, Manitou Springs, Pike's Peak, and other glories, all within a radius of ten miles!

The Concord Summer School of Philosophy.

That remarkable and characteristically American expression of interest in philosophy, the Concord summer school, proved so successful last year that it is likely to become a permanent institution. Nearly six hundred different persons were in attendance, the average number present being about seventy.

The term for the coming season will begin July 10, and continue five weeks, with upward of fifty lectures in all. The following lecturers and subjects have been decided upon, and others will probably be added:

Mr. A. Bronson Alcott, dean of the faculty, five lectures on "The Philosophy of Life;" Mr. Alcott will also deliver the Salutory and Valedictory. Mr. E. C. Stedman will read a poem at the opening session, July 10, 1881. Prof. W. T. Harris, five lectures on "Speculative Philosophy," and five on the "History of Philosophy." Dr. H. K. Jones, five lectures on "The Platonic Philosophy," and five on "Platonism in its Relation to Modern Civilization." Miss Elizabeth P. Peabody, two lectures: (1.) "Dr. Channing;" (2.) "Margaret Fuller." Mrs. Julia Ward Howe, two lectures. Mrs. E. D. Cheney, a lecture on "Color." Rev. J. S. Kidney, D.D., three lectures on "The Philosophic Groundwork of Ethics." Rev. W. H. Channing, three lectures. Mr. S. H. Emery, Jr., two lectures on "System in Philosophy." Mr. F. B. Sanborn, three lectures on "Literature and National Life." Dr. E. Mulford, three lectures on "Political Philosophy." Mr. Denton J. Snider, five lectures on "Greek Poetry and History." Mr. H. G. O. Blake, readings from Thoreau: Mr. John Albee, two lectures; Rev. Dr. Bartol, a lecture; Prest. Porter, of Yale College, a lecture; Mr. D. A. Wasson, a lecture.

The secretary desires that all who propose to attend should send their names to him at Concord. No preliminary examinations are required, and no limitation of age, sex, or residence in Concord will be prescribed; but it is recommended that persons under eighteen years should not present themselves as students, and that those who take all the courses should reside in the town during the term.

Beet Sugar in New York.

The first beet-sugar company in this State has just been organized, and contains some well known New York and Boston names. The factory will probably be located at Schenectady, on account of its nearness to the rich lands of the Mohawk Valley and the facilities which the Erie Canal affords for transportation. Last year about 200 acres were planted with beets in different sections of the valley to test the adaptability of the soil, and the results were entirely satisfactory, both as to quality and quantity per acre. In some cases the percentage of saccharine matter in the roots was extraordinary, reaching as high as 16.86 per cent. This excels the best beets raised in Europe, 10 per cent being the usual yield there, while 13 per cent is considered high. The farmers of the valley are said to look with favor upon the new enterprise.

Locomotives for Mexico.

About the first of March four trial locomotives were shipped from the Baldwin Locomotive Works to the Mexican National Railway, a bid to supply the road with 200 engines having been tendered some time before. A contract for the proposed two hundred has since been signed and the work of construction has been begun. The locomotives are to be shipped as wanted, and all finished before January, 1883. They are to be of exceptional power, and half of them for passenger trains, the rest for freight and general use.

A Novel Dispatch Boat.

A ship which sailed from England for Australia recently took a four-foot "life" boat, designed not to save the passengers but the records of the ship in case of accident at sea. This would seem to be a decided improvement on the conventional bottle, since it will carry more information and be more likely to be seen and picked up. The boat carries a sail, and is expected to make four or five miles an hour in favorable weather.

An Electric Fence.

Dr. J. H. Connelly, of Pittsburg, Pa., has applied to catalogue the old device employed by country druggists to keep loungers from thrusting elbows through their showcases, namely, a wire fence charged with electricity. The electricity is to take the place of the barbs now used on wire fences, the aim being to repel the cattle by a slight shock, instead of by pricking with the risk of severe laceration. It is to be presumed that the doctor is not a practical farmer.