

Plan 3. Lower floor of the botanical building.

- (k) Embryological laboratory.
- (l) Microtomes.
- (m) Assistants in charge of the building.
- (n) Bacteriological laboratory.
- (o) Dr. Lyons's private laboratory.
- (p) Dark room.

Plan 4. Second floor of the botanical building.

- (q) General laboratory.
- (r) Dr. Mottier's private laboratory.

Slight modifications may be made in these plans during the construction of these buildings. They will be ready for occupation June 1, 1899.

EXPLORATIONS IN THE CAVES OF MISSOURI AND KENTUCKY.

BY CARL H. EIGENMANN.

Through a grant of \$100 from the Elizabeth Thompson Science Fund and the liberality of the Monon, Louisville & Nashville, Louisville, Evansville & St. Louis, and St. Louis & San Francisco railroad companies, I have been able to put two short vacations to the best use possible. The first week in September was spent in southwestern Missouri and the southeastern part of Kansas.

While much incidental information was gathered concerning caves and cave animals, the chief work of the trip was to visit Marble Cave in Stone County, Rock House Cave in Barry County, Spring, Day's, Wilson's, and Carter's caves in Jasper County, and a cave whose name I have lost, east of Springfield in Green County, Missouri. The actual results were obtained in Marble Cave, Rock House Cave and Day's Cave.

To reach Marble Cave it was necessary to travel nearly forty miles from the railroad over a rough country well deserving the name of Stone County, for in some places it was a speculation where the inhabitants were able to secure mud enough to stop the chinks in their log houses. Marble Cave opens at the top of a hill that is, I was told, 675 feet above White River, a short distance away. The entrance leads down over a winding stairway and around a pile of fallen debris for over a hundred

feet. The object in quest of which I came to this place was the very rare cave salamander, *Typhlotriton*. It was found in a low passage, so low that going on hands and knees was in many places out of the question. The process of going snake fashion was facilitated by the slippery roof, and, in many places, a muddy floor. A layer of water of varying depth covered the floor. In this water, under rocks, I found the salamanders. It is worth pondering that here, many feet under ground, this salamander has retained the retiring habits of its confreres of the upper surface. I secured four adults and two larvae at this point. One of the adults I met coming down a slippery slope on all fours, while I was going up in the same fashion.

Rock House Cave is reached from Exeter on the Frisco line by a little railroad that runs down hill all the way to Cassville, and thence by buggy to Rock House Cave. Evidently there formerly was an extensive series of underground streams here. The main cave has been obliterated by erosion, which has cut down below the former level of the main cave. As a result we find here a deep, narrow valley with small tributaries emptying into it from caves opening high up on the sides of the valley in little gorges. The largest of these is Rock House Cave, with an entrance large enough to serve as a carriage house. In the gravel of the bed of the small rivulet coming from this cave I secured an additional lot of larval *Typhlotriton*, but could find no more adults. This cave I entered twice by myself.

Day's Cave I had visited a year before when I sat, lamenting and in impotent rage, at the mouth of this hole in the ground. It was full of water, the mouth choked up and I could not get in. Now I came with plans for excavations which I would set on foot while I went elsewhere to look for game. To my delight I found that some enterprising citizens had dug a neat passageway into this cave to see what could be done with the water to supply the town of Sarcoxie. It was still necessary to crawl to get in, but I was at once rewarded, for I caught the new genus of blind fish described in the proceedings of this Academy last year as *Typhlichthys rosae*. I entered this cave twice in one day and secured eight fishes.

I was induced to go on a fool's errand into Kansas by the things described by an old miner with a string of scintillating expletives as being common in the drifts of the extensive mines of that region. But aside from a little experience nothing was gained on this trip.

On November 22d. I started for Mammoth Cave. The objects I especially wanted were the very rare *Chologaster agassizii*, specimens of *Amblyopsis* from south of the Ohio, *Typhlichthys subterraneus* and the cave rat, *Neotoma*. Mr. H. C. Ganter, manager of Mammoth Cave, did everything in his power to make my trip both successful and pleasant.

Although all the likely places were examined, not a single *Typhlichthys* or *Amblyopsis* could be found. After a day in searching for *Chologaster*, when almost despairing, we found, in a little pool of the river Styx, several of these very rare fishes lying on the bottom. As soon as my net touched the water they were off, and since the mud at the bottom was very easily riled but two specimens were secured. Next day the same spot was visited, when two more specimens were secured.

A horse-back ride of several miles brought us to Cedar Sinks. The roof of an enormous cavern has here fallen in ages ago. At one end the overarching rocks, which form part of the sides of this ancient dome, still bear witness to the existence of a former stupendous structure which covered several acres of ground. At the bottom of this cliff a few small openings lead into caves. One of these, judging from the strong current of air passing into it, must be a large cave. In these caves an additional specimen of *Chologaster*, the largest secured, was taken, and this repaid amply for all the trouble it had cost to come.

One cave rat was killed in Audubon Avenue in Mammoth Cave. An account of this rat, as well as of *Chologaster*, will appear elsewhere.

One other catch of great importance was made. I secured a specimen of *Cambarus pellucidus* with young. A good series of these has been preserved for future study.

A few words should be added about Mammoth Cave itself. I came to this cave the second time, regarding it simply as a locality harboring cave animals. Opportunities came to see much of the cave, and I must confess having become impressed with the value of the scientific problem the cave itself presents and the absorbing interest of its scenery. There are really four tiers of caves, one above the other. The upper two stories are dry, but the lowest contains water permanently. The present outlet of the cave is practically on a level with Green River at its low stage, and if the size of the cave increases it can only be by dissolving the bed rocks of the Echo and Styx Rivers. The water is said to rise sixty feet and more during heavy rains, the outlet of the cave streams being very small. The different levels of the cave are joined by direct channels, by

long and devious channels and by wells, some of which, like the Mammoth Dome, are 150 feet from top to bottom. The floor of the main cave is on the second level, while its roof is on a level with the roof of the fourth tier. We can easily imagine that when the Green River had cut through the sandstone overlying the limestone in which the cave has been formed, an outlet for water collecting in the crevices of the limestone was found near the present entrance of the cave. The main crevice developed into a large stream, cutting down and dissolving the rock much more quickly than its smaller tributaries. The tributaries fell into the main stream in little cascades and their floors, the present fourth level, remained permanently above the main cave or second level. As Green River cut through its limestone bed a lower exit was opened for the waters of this primeval mammoth river, and later still, a lower. By the formation of the pits and winding channels the water finally permanently abandoned the upper channels and is found now only in the lowermost levels. When this process began only aquatic animals could enter the cave. Even after the cave had become quite large it probably became full to the top during floods. This is still the case in many caves of Indiana. As a matter of course only aquatic animals were able permanently to establish themselves. But when the upper levels became permanently dry other animals could and did enter the caves and others are evidently still colonizing them.

The scenic parts which make the most lasting impression are Echo River, the Mammoth Dome and the main cave. The main cave is simply a very large winding tunnel, not startling in any way, but by the time one has walked for an hour or two it begins to impress one very forcibly. The Star Chamber and Martha Washington Statue, in this part of the cave, are remarkable in their way. The echo of Echo River lasts but twelve or fifteen seconds. It is remarkable for the blending of simple sounds, not for the repetition of words or phrases.