SCIENCE:

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OBSERVATIONS ON GOPHERS AND MOLES IN OREGON.

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THE Zoölogical Department of the Oregon State Experiment Station has endeavored for two years to find some remedy for the pocket gopher and common mole found in this section. The first named, *Thomomys bulbivorus*, is a bad pest, and the decree has gone forth that our mole, *Scapanus townsendii*, is to be placed in the same category. Various traps purporting to catch gophers and moles are on the market, but few of them are reliable. Two, however, have been found to do very effective work in the case of both animals. Of poisons, powdered strychnine, introduced into pieces of potato an inch square and thrust down the burrows, has proved efficacious in the case of gophers in the absence of succulent root-crops. And small pieces of beef, poisoned with the same agent, have been placed in moles' burrows with occasionally good results, though nothing conclusive can be claimed for that now.

It is, however, of a few habits of the gopher, and more particularly of some interesting discoveries regarding the diet of the mole that we would here treat.

The pocket gopher has not a little intelligence. The horticulturist of this station reports finding a nest stored with potatoes, the tubers lying in layers, and each layer separated from the adjoining layers by more or less dried grass. The entrance to this nest, or at least one entrance, was from below, affording a perfect system of drainage quite desirable in this country of wet winters.

Again, it is a matter of frequent occurrence to see gopher mounds arranged in a straight line from that side of a field or garden upon which the gopher enters to some fruit-tree or potato, parsnip, or carrot patch, indicating that his main burrow beneath the surface has been pushed directly to these sources of food-supply. This main burrow, by the way, is from twelve to twenty inches below the surface, and has leading from it, at intervals, short branch burrows, which open on the surface of the ground and afford a means of getting rid of the soil excavated below. These branches are generally plugged with soil and their openings covered by a mound. The last one made, however, is often open, and the occupant of this underground retreat can frequently be seen protruding his head and disposing of the soil he has brought from the main burrow. As to the method of bringing out this soil opinions differ, some observers claiming that it is carried in the pockets, to some extent at least, and then thrown out of the pockets by movements of the fore-feet. Others deny this, asserting that the dirt is pushed before the animal and that the pockets are not used in this work. The writer has frequently secured specimens with forage in these pouches, but has never found them to contain earth, even in specimens killed in the act of excavating.

This rodent works during the night and is quite likely to be found digging early in the morning, again about noon, and again late in the afternoon. It is claimed that both the gopher and mole are more active, as regards digging, just before rain.

The nest of the pocket gopher is often found filled with camass bulbs, of which this animal is very fond, as much as a bushel of bulbs being reported as found in a single nest. When in the vicinity of gardens, however, more palatable food is found with which to store the larder.

The tender roots of young fruit-trees are, unfortunately, very tempting to these animals, and a dying cherry or apple can frequently be easily lifted from the ground, the root, gnawed completely through, showing the cause of its demise.

This leads to the subject of the mole's diet. Many, or most, of our scientists have united in defending the mole against charges of eating bulbs and other vegetable matter, and have stoutly asserted that the gnawed carrot, or parsnip, or crocus bulb, found in the course of the mole's burrow, was the work of one of the meadow mice. This is doubtless true. But that the mole occasionally, or possibly frequently, resorts to a vegetable diet must be acknowledged. A lady in Portland, Ore., quite sure that moles were eating her crocus bulbs, and feeling far from convinced of their innocence from the assertions of scientists, obtained three, which she kept in confinement. She found that they readily ate the following: Beef, mutton, pork, bread, wheat, pears, and peas. Unfortunately two of these pets were fed with worms taken from an old manure heap and died, showing symptoms of being poisoned. The description of these worms, as given me, answered to that of *Lumbricus fœtidus*, and it was undoubtedly that or an allied form which caused the trouble. Evidently this species of the Oligochetæ does not figure, naturally, on the mole's bill of fare. The writer witnessed the survivor eat peas greedily, running his sensitive snout from one end of the pod to the other and taking out every pea. This was convincing proof that the mole, under some circumstances at least, is not strictly carnivorous, and it is quite likely that he is frequently a malefactor as regards vegetables and roots. Personal examination of stomachs in specimens secured in March, 1892, revealed nothing but finely triturated earthworms, insects, and insect larvæ. In one captured in January, 1893, the stomach contained nothing but delicate, fibrous roots.

Amos W. Butler of Brookville, Ind., in speaking of moles, says: "I have never been satisfied that the mole in sandy soil is not very destructive to young pea sprouts just as they are emerging from the ground."

Both gophers and moles are active here during the winter season.

A word as to the breeding season may not be out of place. My diary states that on Feb. 28, 1892, a pregnant mole was captured containing three well-developed embryos, and two days later another was obtained with two embryos, apparently within a few days of birth. March 28, 1893, a pocket gopher was secured containing four young embryos. All this indicates an early date for the first litter. Probably more than one litter is produced. From specimens of Arvicolinæ secured it would appear that the breeding time of the field-mice is contemporaneous with that of the other two animals under discussion.

ONE OF THE GYPSUM CRYSTALS FROM THE CAVE AT SOUTH WASH, WAYNE CO., UTAH.

BY ALFRED J. MOSES, MINERALOGICAL LABORATORY, COLUMBIA COLLEGE, NEW YORK.

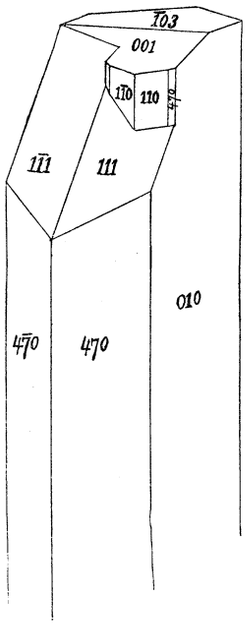
THE Deseret Museum of Salt Lake City sent last month to Columbia College two specimens from the remarkable deposit of Selenite, in Southern Utah, which was described in a recent issue of this paper.[1]

The larger of the two specimens was a portion of an evidently longer prism with very perfectly developed terminal planes. The specimen internally is colorless and glassy, but the surface is in part covered by a thin opaque layer. The weight of the specimen

[1] Feb. 17, 1893, pp. 85-86.

is 24½ pounds, its greatest length is 27 inches, its thickness (in direction of the ortho axis), is 4 inches, and its breadth (at right angles to the ortho axis) is six inches.

The angles of the crystal were taken with the hand goniometer. The most noticeable fact is that the unit prism of 111° 30′ occurs only on a curious prismatic extension, composed of this prism and a clino prism (470), which pierces the pyramidal plane 111 and extends upward about one inch to the basal plane common to this and the rest of the crystal as shown in the figure. The prism which occurs on the rest of the crystal has an angle of



approximately 79°, corresponding to the clino prism i—$\frac{1}{4}$ (470), and all its faces are striated vertically while those of the unit prism are smooth.

The other occurring forms are i–$\bar{i}$ (010), –1 (111), $\frac{1}{3}$–$\bar{i}$ ($\bar{1}03$), and O (001). The cleavages parallel to (010), ($\bar{1}01$) and ($\bar{1}11$) were visible in the break at the lower end.

At least six phantom terminations can be seen apparently parallel to (001) and ($\bar{1}03$).

DISTANCE AND COLOR PERCEPTION BY INFANTS.

BY J. MARK BALDWIN, PRINCETON, N. J.

I UNDERTOOK at the beginning of my child H's 9th month to experiment with her with a view to arriving at the exact state of her color perception, employing the new method which I described and compared with other methods in a recent paper in this journal.[1] The method consisted in this instance in giving the infant a comfortable sitting posture, kept constant by a band passing around her chest and fastened securely to the back of her chair. Her arms were left bare and quite free in their movements. Pieces of paper of different colors were exposed before her, at varying distances, front, right, and left. This was regulated by a frame-work, consisting of a horizontal graded (in inches) rod, projecting from the back of the chair at a level with her shoulder and parallel with her arm when extended straight forward, and carrying on it another rod, also graded in inches, at right-angles to the first. This second rod was thus a horizontal line directly in front of the child, parallel with a line connecting her two shoulders, and so equally distant for both hands. This second rod was made to slide upon the first, so as to be adjusted at any desirable distance from the child. On this second rod the colors, etc., were placed in succession, the object being to excite the child to reach for the color.

So far from being distasteful to the infant, I found that with pleasant suggestions thrown about the experiments, the whole procedure gave her the most intense gratification, and the affair became her most pleasant daily occupation. After each sitting she was given a reward of some kind.

The accompanying tables give the results, both for color and distance, of 217 experiments. Of these 111 were with five colors and 106 with ordinary newspaper (chosen as a relatively neutral object, which would have no color value and no association to the infant). In the tables R stands for "refusal" (to reach out for the object), A for "acceptance" (and effort), N for the entire number of experiments with each color respectively, and n for the entire number with all the colors at each distance respectively.

So $\frac{A}{N}$ = the proportion of responses or efforts for any color, and

$\frac{R}{n}$ = the proportion of refusals for each distance.

Table I.

Distance, inches.	9		10		11		12		13		14		15		Totals.			Ratio $\frac{A}{N}$
	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	N.	
Blue.	0	1	0	4	0	5	1	3	2	4	1	5	3	1	7	23	30	.76⅔
Red.	0	1	0	3	2	2	1	4	1	7	1	7	5	1	10	25	35	.71⅓
White.	0	0	0	0	0	0	0	1	0	5	1	1	3	0	4	7	11	.63⅔
Green.	0	0	0	1	0	1	2	1	1	4	1	2	2	0	7	9	16	.56⅓
Brown.	0	1	0	2	2	1	3	2	0	3	3	1	2	0	11	10	21	.47⅔
Totals.	0	3	0	10	4	9	7	11	4	23	7	16	15	2	37	74	111	.67
Ratio $\frac{R}{n}$	0		0		.33⅓		.39		.15		.30⅔		.89					

Table II.

Distance, inches.	9		10		11		12		13		14		15		Totals.			Ratio $\frac{A}{N}$
	R.	A	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	R.	A.	N.	
Newspaper.							0	17	0	28	1	33	25	2	26	80	106	.75½
Color.	0	3	0	10	4	9	7	11	4	23	7	16	15	2	37	74	111	.67
Totals.	0	3	0	10	4	9	7	28	4	51	8	49	40	4	63	154	217	.71
Ratio $\frac{R}{n}$					.30⅓		.20		.07¼		.14		.91					

Color.— The results are evident in the tables (I. and II.), especially the columns marked "Ratio $\frac{A}{N}$" and "Ratio $\frac{R}{n}$." The colors range themselves in the order of attractiveness, i.e., blue, red, white, green, and brown. The difference between blue and red is very slight compared to that between any other two. This confirms Binet as against Preyer (who puts blue last), and also fails to confirm Preyer in putting brown before red and green. Brown to my child — as tested in this way — seemed to be about as neutral as could well be. White, on the other hand, was more attractive than green. I am sorry that my list does not include yellow. The newspaper was, at reaching distance (9 to 10 inches) and a little more (up to 14 inches), as attractive as the average of the colors, and even as much so as the red; but this is probably due to the fact that the newspaper experiments came after a good deal of practice in reaching after colors, and a more exact association between the stimulus and its distance. At 15 inches and over, accordingly, the newspaper was refused in more than 92 per cent of the cases, while blue was refused at that distance in only 75 per cent, and red in 84 per cent.

Distance.— In regard to the question of distance, the child persistently refused to reach for anything put 16 inches or more away from her. At 15 inches she refused 91 per cent of all the

[1] Science, April 21, 1893.