of gain and the metabolism of the food given. From the results so far attained with thirty-five animals fed in series of five each, it would appear that there is a definite relation between the amount of lime and magnesia that enters into the animal organism. In the case of added lime, especially with the calcium phosphate, there is an increase in the rate of gain with a reduction of the amount of food required per pound of increase. A very small addition of a magnesium salt also appears advantageous when fed with a lime compound, though the point of benefit is easily passed. Where the magnesium is given regularly in any excess the gain in weight is reduced to a minimum. Though the health of the animal may be apparently unaffected and the coat noticeably smooth and glossy, there is but little gain in weight from the food consumed. Another instance of the action of magnesia may be here noted. In fattening beef cattle for market they are fed large quantities of grain and occasionally become surfeited or, as it is termed, get 'off feed' for several days. By giving an animal in such cases magnesium sulphate it is quickly brought back to its regular ration. In human medicine calcined magnesia is given when the system has become overcharged with food as in some cases of dyspepsia and gout. As the concentrated feeds such as grains are rich in magnesia as compared with lime, while in the growing plant the opposite is true, it seems reasonable to suppose that magnesia operates favorably in the assimilation of food materials when present in the proper proportion, especially in heavy feeding. The results from the presence of lime and magnesia in the animal body in excessive amounts may be somewhat understood from their well-known physiological tendencies, *i. e.*, the lime compounds are constipating, while the magnesium salts are laxative in their nature.

From the effect of lime compounds in the animal body from both a medical and a dietetic standpoint this element may be said to be constructive and fixative in its results. On the other hand, magnesia is more movable in its relation, serving to carry assimilable phosphoric acid, which it gives up readily, and is thereby enabled to repeat the process many times. Therefore, a too small amount of magnesia is less detrimental than a deficiency of lime. If, however, with magnesia in excess there is a tendency for the lime as the stronger base to unite with the acid of the magnesium salt and the magnesia to form magnesium nucleo-proteids, such a disturbance would result in the elimination of products rather than in a further constructive effort. In the physiological effect of an excess of magnesia in the animal organism we find such a result indicated.

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## NOTES ON THE EVIDENCES OF HUMAN REMAINS FROM JACOBS' CAVERN.

BY the courtesy of Dr. Charles Peabody, Director of the department of archeology, Phillips Academy, Andover, Mass., and of Professor Warren K. Moorehead, curator of this department, the writer was permitted during the month of May, 1903, to examine and assist in excavating a cave in southwest Missouri, in which were found numerous evidences of human occupancy. The cave is located on the north bluff of Little Sugar Creek two and one half miles southwest of Pineville, the county seat of McDonald County, four miles from the Arkansas line and fourteen east of the Indian Territory line. In honor of the discoverer, Mr. E. H. Jacobs, an enthusiastic archeologist of Bentonville, Ark., the cave has been named Jacobs' cavern. To each of these gentlemen are due my sincere thanks for many kindnesses extended during a week's visit to their camp.

The hills along Sugar Creek are composed of massive ledges of limestone containing a large amount of flint and chert, in the form either of regular layers or of nodular concretions. To this formation the name Boone chert has been applied by geologists. It is the rock that outcrops extensively in the southwest part of Missouri, the northeastern part of the Indian Territory and northern Arkansas. In the lower part of the Boone, flint is often absent and the rocks consist of massive gray limestone arranged in definite

layers. To this part of the formation the name St. Joe limestone has been applied. The St. Joe is sometimes sixty feet or more thick, and often weathers into characteristic precipitous or overhanging bluffs extending for miles along the streams.

Immediately beneath the St. Joe limestone is a mass of shales sometimes attaining a thickness of fifty feet, known as the Eureka shales. These shales are usually black and papyraceous, weathering into thin flakes or tablets. Throughout the region thousands of springs issue from between the Eureka and the St. Joe.

Jacobs' cavern is located in the St. Joe limestone some forty feet above the level of Little Sugar Creek. The cave faces southwest, overlooking the narrow valley. The bluff above the cave continues to the height of one hundred and fifty feet or more, the upper part being composed of Boone chert.

The cave is in fact but a rock shelter, irregularly V-shaped in outline, with floor, walls and roof of limestone. The flat top is composed of a single stratum of limestone, and stratification lines are well exhibited on the sides of the cave. Along the front the entire length of the rock shelter is approximately seventy feet; the extreme depth is fifty feet. Before removing any of the contents the height was from four to seven feet. The floor was covered, however, by two deposits, one of clay and one of ashes, aggregating six feet thick, so that the distance from the limestone floor to the limestone roof is approximately twelve feet.

The rock floor was covered to the depth of three feet with clay, usually yellowish-brown in color, containing numerous fragments of limestone. This clay was probably formed by the disintegration of the limestone and so far as noticed has never been disturbed. On the clay was a layer of wood ashes averaging three feet in thickness. Throughout the greater part of the cave these ashes were so loose and dry that the men engaged in removing them were obliged to use sponges in order to avoid breathing the ashes. In fact several of the men were unable to continue the work on this account. Mingled with the ashes and sometimes extending into the subjacent clay were slabs and blocks of limestone fallen from the roof.

At the back of the cave there is a fissure extending upward to the height of ten feet or more, separating the roof of the cave from the rear wall. This fissure, which is probably a master joint in the limestone, is from eighteen inches to three feet wide and continues for some distance beyond the main part of the cave, where it divides into a lower and an upper part separated by a block of limestone.

All along this fissure and also along part of the back of the cave beyond the point where the fissure extends, there are numerous stalactites, stalagmites and pilasters formed by water dripping from the roof. In places the entire fissure above the level of the roof is filled with this material. The continued dripping of water carrying $CaCO_3$ on the ashes covering the floor of the cave has formed a sort of stalagmitic ash breccia often enclosing flint flakes, implements and bones. In these stalagmites charcoal is often present. That this ash breccia was formed gradually and after the deposition of the ashes is proved by the peculiar toadstool-like shape of some of the pillars. It seems from the shape that ashes were first laid down, then the dripping of the water formed the brecciated mass, then other ashes were deposited, other breccia formed, then further deposits of ashes, and so on till the entire pillar was formed. The clay beneath the ashes near the back part of the cave is in many places cemented by the action of lime forming a clay and limestone breccia.

Scattered about in the ashes and enclosed in the stalagmitic breccia at the back of the cave were found a number of objects which point to the fact that the cave has been occupied by man. These objects may be divided into eleven groups, of which seven may be considered as witnessing to human occupancy, and four may or may not bear such testimony. The objects are as follows:

A. Objects witnessing to the human occupancy of Jacobs' cavern: (1) Human bones, (2) pottery, (3) flint implements, (4) stone

implements, (5) bone implements, (6) clam shells, (7) ashes and charcoal.

B. Objects which do not certainly bear testimony to human occupancy: (8) Flint flakes, (9) animal bones, (10) sandstone fragments, (11) polished rocks.

It will be obviously impossible in a paper of this kind to do more than simply mention these objects. All detailed study must be reserved for those more skilled in the discussion of such data.

*Human Bones.*—Fragments of at least four human skeletons were discovered in the ashes. One of these skeletons, including a skull in a good state of preservation, was nearly complete.

*Pottery.*—Fragments of at least six vessels were found, including one handle. Several of the fragments were decorated.

*Flint Implements.*—Chipped flint implements are quite common, more than one hundred specimens having been found. These implements include arrow points, drills, spear points, knives, scrapers, etc., as well as cores from which knives were obtained. The flint is in most cases similar to that found on the hills near by, but in some cases it is believed to have been carried for considerable distances.

*Stone Implements.*—One large stone mortar was found, as well as hammer stones, a stone hatchet and stones used for sharpening implements.

*Bone Implements.*—Several awls, needles, scrapers and other implements fashioned from bone were secured.

*Clam Shells.*—A number of shells of *Unio* were taken from the ashes. At least two genera are represented, both probably being found at the present time in Sugar Creek.

*Ashes and Charcoal.*—As stated above, the floor of the cave was covered to the depth of some three feet with wood ashes. A conservative estimate would place the amount of ashes at 5,000 cubic feet. Intermingled with the ashes was a large amount of charcoal varying in size from small specks to lumps the size of a walnut. It was in the ashes that the other objects mentioned in this paper were found.

*Flint Flakes.*—Thousands of flakes of flint were found in the ashes and embedded in the stalagmites. This flint varies in size from small slivers to pieces the size of the hand. Careful search was made along the walls and roof of the cave to detect the presence of flint in the limestone, but without success. There is plenty of flint at a horizon fifty feet higher, but so far as known there is none in the strata in which the cave is located. For this reason it is believed that the flint was carried into the cave.

*Animal Bones.*—Great numbers of bones of various animals, including mammals, birds and turtles, were found among the ashes and embedded in the stalagmites. These bones have not yet been identified but it is probable that a large part of them are those of living species.

*Sandstone Fragments.*—A number of small pieces of unshaped sandstone were obtained. The nearest point, so far as known, where sandstone outcrops is four miles distant from the cave, in the vicinity of White Rock. It seems probable that the sandstone has been carried into the cave.

*Polished Limestone.*—A number of flat limestone slabs that have fallen from above, both just within the cave's mouth and particularly along the foot of the bluff a few feet distant, have been polished or glazed apparently by the friction or contact of greasy bodies. These polished rocks are invariably in such a position as most readily to serve as seats or reclining places for the inhabitants of the cave. There are more than twenty of these slabs that exhibit this peculiar structure.

CHARLES NEWTON GOULD.
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May 16, 1903.

## NEW TERMS IN CHEMISTRY.

IT may not be out of place to call attention to several new terms which have recently been submitted to the English-speaking scientific world and to discuss their merits. However reluctant we may be, in view of possible misunderstandings, to accept new words and phrases, the need of them is often unquestionable, and it only remains for us to determine the proper forms which the words shall take.