ART. XXVII.—*Contributions from the Sheffield Laboratory of Yale College.* No. XXXVI. — *On some interesting Equine Calculi;* by R. H. CHITTENDEN, Ph.B., Assistant in Physiological Chemistry.

IN the latter part of April, 1875, a mare, the property of Mr. N. A. Baldwin of Milford, Conn., was taken sick apparently with colic. One peculiar feature of the case was that all passage of solid excrement ceased. After a few days the animal died. A post mortem examination was made and in the intestine, about one foot from the stomach, was found a calculus closing up the passage completely. In the stomach was found another calculus of the same appearance, but a third larger. A year previous to this the animal was taken sick in the same manner, and as a result of treatment passed a calculus differing from the others only in size, being somewhat smaller. Through the kindness of Mr. Baldwin, I was able to obtain these calculi for examination. The following is the result: The smallest calculus was perfectly smooth, nearly round and of light-brown color, its nucleus was a small pebble around which the material was arranged in concentric layers, preserving the form of the nucleus. A short distance from the center was a small, loose, irregular layer of organic matter, seemingly pieces of chaff, etc. The remaining portion was hard, compact and divided into a multitude of layers by slight shades of color. The weight of the two halves together was 213·22 grams. The calculus found in the stomach was of a yellowish brown color, its surface was covered with broad veins of a light yellow intermixed with narrow ones of a darker shade; it was nearly round, its circumference one way being $11\frac{1}{2}$ inches, the other $11\frac{1}{4}$ inches, its weight was 679·6 grams. The calculus found in the intestine and which caused the death of the animal, weighed 441·57 grams; its nucleus was a thin and narrow piece of iron half an inch long. A transverse section revealed the same internal structure as the other, except that in this there was an extra spot of hair-like matter in the compact layer about the nucleus. The surface of the calculus, like that of the others, was perfectly smooth. On fracturing half of this calculus it separated readily into four distinct and regular layers, each of which was made up of smaller ones which could not be separated. On dissolving the substance in cold dilute nitric acid, a pale yellow fluid was obtained and a residue made up of organic matter, with a little silica. Not a trace of uric acid was found in any of the layers. The first or outer layer was nearly $\frac{1}{8}$ of an inch thick; its specific gravity was 1·72. The second layer was $\frac{5}{16}$ of an inch thick, with a specific gravity of 1·69. The third layer was $\frac{1}{4}$ of an inch

thick, specific gravity 1·66. The nucleus portion measured one way $1\frac{5}{16}$ inches, the other way $1\frac{7}{8}$ inches; specific gravity 1·71. While the three outer layers were yellowish-brown the nucleus portion was dark-brown, making a distinct contrast in color. The following are the analyses of the different layers;

	1st layer.	2d layer.	3d layer.	Nucleus portion.
P_2O_5	28·10	28·14	28·34	28·14
MgO	16·84	16·87	16·88	16·58
$(NH_4)OH$	12·57	12·59	12·61	12·61
H_2O	41·72	41·80	41·66	41·96
Residue insol. in HNO_3	·74	.58	·58	·60
	99·97	99·98	100·07	99·89

On igniting the substance at a red heat all the water and ammonia was driven off, thus giving the amount of these two substances. Then determining the ammonia directly by means of magnesia and deducting from the total volatile matter the amount of water was thus indirectly obtained.

These analyses show that this calculus is composed principally of ammonio-magnesian phosphate, and that the different layers are essentially the same. By making thin and polished sections of the different layers and examining them under the microscope with a half inch objective, they were found to be amorphous, but divided into layers by what seemed to be fine black lines, and on examination with a fifth of an inch objective these lines were resolved into fine black specks which may be looked upon as impurities in the phosphate, with regular arrangement, and which are insoluble in nitric acid. With polarized light a fine arrangement and display of colors was obtained.

The other two calculi were not at my disposal for analysis, but from their exact resemblance to this in external and internal structure and color, there is no doubt but that their composition is the same.