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attaches the shafts B to the body of the waggon, is then to be removed, and with the shafts to be placed in a similar manner at M on the other end of the waggon, which now becomes the fore part, the horse drawing it back to be again loaded. Whenever the waggon is ascending, the checks behind the waggon may occasionally be let down and used as rests to relieve the horse when necessary.

XLIII. *Experiments made upon new Ivory, fossil Ivory, and the Enamel of Teeth, in order to ascertain if these Substances contained Fluoric Acid. By Messrs. FOURCROY and VAUQUELIN. Read in the French Institute*.*

By a letter inserted in No. 165 of the *Annales de Chimie*, (see Philosophical Magazine, vol. xxiii. p. 264.) M. Gay Lussac, the pupil and friend of M. Berthollet, announces that Mr. Morichini, a chemist at Rome, had discovered the presence of the fluoric acid in new ivory, fossil ivory, and the enamel of teeth; he found that new ivory was almost entirely formed of fluuate of lime, and that the enamel of teeth contained nearly 22 per cent. of fluuate of lime.

This discovery is so interesting, that it becomes every man of science to ascertain the truth of it. We shall give in this paper the result of the experiments made by us upon the subject in the laboratory of the Museum of Natural History.

As it would have been difficult, and perhaps impossible, to make the sulphuric acid act conveniently upon these substances, if they had not been first cleared of their animal gluten, we began by calcining them in an open crucible.

1st, New ivory lost by this calcination	-	45 per cent.
2d, Fossil ivory of Siberia	- -	41½
3d, Fossil ivory of Loyo	- -	41
4th, Fossil ivory of Lourque	- -	18
5th, Fossil ivory of Peru, found at 1176 feet above the level of the sea	- -	15
6th, Fossil ivory of Argenteuil	-	14
7th, Enamel of teeth	- -	11½

* From *Annales de Chimie*, tom. lvi. p. 37.

The differences which exist among the losses experienced by the different ivories in calcination may be explained by the state in which they are found: the fossil ivory of Siberia and of Loyo were almost entirely in their natural state; they preserved the greatest part of their animal gluten and their organization, while those of the canal of Lourque, of Peru, and of Argenteuil, had lost this matter and had become dry. The latter, also, easily split into scales, were extremely brittle, and sent forth only a very slight animal smell during calcination: as to the enamel of teeth, the small loss which it sustains by the same operation, announces that it contains much less humidity or animal mucilage than other bones, as was before well known: the latter assumed a bright blue colour upon being exposed to heat, which proves that it contains a notable quantity of phosphate of lime.

After having been calcined and pulverized, each of these matters was treated in the following manner, to know if we could ascertain the presence of the fluoric acid. Portions of the calcined ivories were placed in a common phial, and also in a small retort: four parts of concentrated sulphuric acid were poured upon the ivory; to these vessels was adapted a glass tube which was inserted in lime water, and they were then heated. In each of these experiments no more than twenty grammes were employed at a time, and never less than five.

Neither fresh ivory nor the enamel of teeth gave any traces whatever of the fluoric acid: the fossil ivories of Siberia and of Loyo were alike destitute of it; but those of the canal of Lourque, and Argenteuil, gave evident signs of this acid. In the latter cases, the upper part of the phials and retorts, as well as the tubes made use of, were covered with a white powder, the properties of which resembled silix; in the other cases nothing similar appeared.

These first results having inclined us to doubt the existence of the fluoric acid in new ivory, as well as in such ivory (although fossil) which still retained almost entirely, and without alteration, the animal matter, we made artificial mixtures, with fresh ivory and fluat of lime, in the several proportions of a 25th and a 40th part; and always,
even

even in the latter case, we observed, in a very remarkable manner, the effects of the fluoric acid upon the glass when these mixtures were treated as above mentioned. These effects were even much more sensible than those produced by the fossil ivories of the canal of Lourque and of Argenteuil; which shows that the fluuate of lime does not exist in a greater proportion than three or four per cent.

Those who have announced the discovery of the fluoric acid in ivory, do not assert that this substance was found ready formed in it, although they recollect that formerly Rouelle tried in vain to extract phosphorus from it; yet upon treating 300 grammes of it in the same manner in which bones are treated for the purpose of obtaining phosphorus from them, we obtained 15 grammes of very pure phosphorus in a very pure state. This quantity of phosphorus is nearly the same as that obtained from bones; and it is probable that we might have had still more, if the retort had not broken before the operation was entirely finished.

If by the first operation to which we submitted the fresh ivory we had not perceived any vestige of the fluoric acid, the circumstance which we are about to relate proves that it contains phosphoric acid in abundance, and probably as much as bones do.

The pungent smell which is disengaged at the moment when the sulphuric acid is mixed with calcined new ivory, cannot be regarded as a certain mark of the presence of the fluoric acid, because there is produced in this case a degree of heat so considerable as to volatilize with the water a small quantity of sulphuric acid: besides, this vapour manifests itself also during the mixture of the sulphuric acid with such bones, where the presence of the fluoric acid is not admitted.

Several chemists in Paris, having repeated the same experiments upon ivory, obtained results nearly similar to ours.

Although we have not found fluoric acid in new ivory nor in the enamel of teeth, as announced by M. Morichini, it is nevertheless clear, that such fossil ivories, of whatever country they are, as have lost their animal matter, contain some hundredths of fluoric acid. This truly singular circumstance seems to indicate that these substances are, after
cumstance

a long period, impregnated with fluoric acid,—a fact which supposes that this acid exists in the earth; for to suppose, with M. Klaproth, that the phosphoric acid is partly converted into fluoric acid, would be to admit an hypothesis too distant from our actual knowledge to appear even probable.

If the fluoric acid really existed in new ivory and the enamel of teeth, it must follow that a chemical analysis would find it in vegetable and animal substances; at least one would suppose that it would be developed in the living animal œconomy; which is extremely hypothetical, and without any rational foundation.

It seems more probable, therefore, that during the long continuance of these substances in the earth, they combine with the fluoric acid. By the former hypothesis the fluoric acid must be supposed to exist over all the world, since fossil ivories, wherever found, always contain this acid; by the second hypothesis we must be forced to admit the change of some principle in the ivory into fluoric acid, which is not altogether impossible: in truth, as we are ignorant of the nature of the fluoric acid, we cannot appreciate the manner or the cause of these transmutations in the present state of chemistry.

XLIV. *Proceedings of Learned Societies.*

ORIGINAL VACCINE POCK INSTITUTION,
Broad Street, Golden Square.

DR. Shaw in the chair.—The chairman having stated that it was a subject of conversation, that one of the surgeons of this institution having inoculated his own child for the small-pox, was apparently inconsistent with the declarations to the public by this establishment, and requiring explanation; it was,—Ordered, that the following letter, with this notice, be sent to the gentleman in question.

O. V. P. J.—July 8, 1806.

Sir,

I am directed to transmit you the above notice, and to request the favour of an explanation; but the board and medical establishment beg you to understand, that they do not think they have a right to consider you as acting im-
properly,