Pliny's Water-Mill.

IN connexion with the letter on "Pliny's Water-Mill" in NATURE of June 13, the accompanying photograph (Fig. 1), taken by me at Ching-chong-do, in Korea, in September 1899, may possibly be of interest. It represents a water-actuated 'pestle and mortar' commonly used at that time in the hill country of Korea for hulling rice.

The apparatus consists of a beam, generally the rough trunk of a tree, about fourteen feet long, to one end of which is attached a wooden box capable of holding water, and to the other end a piece of tree trunk about two to three feet long, fixed at right

FIG. 1.—Water-actuated pestle for hulling rice, at Ching-chong-do, Korea. The bucket is shown in the act of spilling its water.

angles to the beam. This last forms the 'pestle'. The rice to be treated is in a wooden or stone 'mortar' beneath it.

The main beam with its appurtenances is balanced on a trestle so that it is free to move up or down like a 'see-saw'.

When the box has filled itself with water from the continuous supply furnished through the wooden trough shown above it in the photograph, the pestle at the other end rises above the mortar, and immediately the tipped box empties its water, causing the pestle to drop with a powerful blow on the rice in the mortar. The box automatically rises to the filling position again, and the sequence is repeated indefinitely. The photograph shows the box in the act of tipping and spilling its water.

The straw-covered hut in the left background of the photograph contains most of the beam, with the pestle and mortar. Its interior was too dark to photograph.

H. GLENDINNING.

Glenalmond,
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June 15.

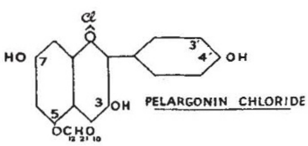
MR. H. P. VOWLES's account in NATURE of June 13, p. 889, of the Kashgar water-mill is a great help towards the understanding of a hard passage, the difficulty of which is much increased by corruption of Pliny's text. For one false reading Mr. Vowles's *undershot* water-wheel suggests at once the necessary emendation; Rotis etiam quas aqua verset *obiter* et molat: for *obiter*, hitherto unintelligible, read *subter*. I suggest also that in the preceding phrase *ruido pilo* does not at all mean a *roughened* pestle, but is equivalent to *ruente pilo*, and means a *falling* pestle, or drop-hammer—precisely what the sense requires. We may then translate: "In Italy, falling pestles, or drop-hammers, are mostly used; and the grinding is moreover carried on by means of wheels, turned by a stream *flowing underneath*". *Pilum Graecum*, which occurs in a Plautine fragment, "quasi tolleno aut pilum Græcum reciproces", seems to have been the technical name for the pair of alternate hammers, working precisely as in the Kashgar mill.

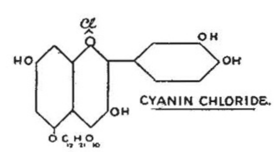
A more curious error lurks in the preceding clause. The pestle, Pliny tells us, is armed with teeth: so that unless the miller keeps a sharp look-out while he is grinding (*nisi intenti pisant*), the grain will be cut or chipped (*concidantur grana*), and the iron-work smashed to bits (*ferrumque frangatur*)! It would surely need rough handling to do so. Now the grain in question was *far*, or spelt; and we know that our miller was not grinding it to flour or meal, but merely cleaning or husking it for groats; and he had to work carefully and use a light hand lest the grain be chipped or broken, and—*ne farreum frangatur*—lest his *groats* be spoiled.

D. W. T.

The Chemical Effect of a Mendelian Factor for Flower Colour.

IN 1914, Willstätter isolated the anthocyanin pelargonin from the flowers of the scarlet *Pelargonium zonale*, and stated that a certain violet-red variety contained cyanin, with a trace of pelargonin. Recently, Robinson and his collaborators have shown that in both these diglucosidal pigments the sugar residue is probably attached at position 5 on the anthocyanidin molecule. If this is so, the only structural difference between these two pigments is the extra hydroxyl group possessed by cyanin at position 3′.





These anthocyanins can easily be distinguished by means of the distinct colour reactions given by their crude dilute hydrochloric acid extracts on addition of excess sodium carbonate solution. Scarlet-red solutions of pelargonin should give an intense violet-red, whilst the cherry-red ones of cyanin turn a pure blue. Extracts containing both pigments give intermediate colours. With the pale-coloured flowers, owing to a higher proportion of flavone pigment in the crude extracts, a green colour may be obtained which masks the true reaction and necessitates a preliminary purification. The presence of even small amounts of pelargonin can also be detected by the characteristic fluorescence given by this pigment when in acid-alcoholic solution.

The genetical basis of the formation of these two pigments is being investigated. The rose-pink variety 'Constance', on selfing by Miss Cranfield, of the John Innes Horticultural Institution, gave seventeen plants resembling the parent and three salmon-pinks, the latter colour being clearly recessive.

On testing, the rose-pink flowers were found to contain cyanin, a slight trace of pelargonin, and an appreciable amount of flavone, while the salmon-pinks contained only pelargonin with a trace of flavone.

The effect of the factor which converts salmon into rose is, therefore, to substitute cyanin almost