

analogous substance, the plant may continue to live, though in less perfect health. Thus potash may be to a certain extent replaced by soda, and, as has been observed in certain samples of tobacco, even by lime. In the case of the grape, no rotation of crops is possible, and the probability of exhaustion is therefore so much the greater. The juice of the grape is very rich in potash, which is deposited, on standing, in the form of crude tartar. This potash is not returned to the soil, but is consumed for manufacturing purposes. Without having had the opportunity of proving this view by analysis, I am of opinion that the soil of old vineyards will be found deficient in potash. As a means of remedying this defect, I suggest that granite should be heated to redness, plunged in water, and ground to powder. Let this be well mixed with about half its weight of lime, and the mass be exposed for some time to the action of the atmosphere. This compost may then be sparingly applied as a manure to the vines.

J. W. SLATER.

On the Cause of the Rhythmic Motion of the Heart.

By JAMES PAGET, Esq., F.R.S.

The author draws the following conclusions as to the most probable explanation of the rhythmic action of the heart:—

1. In the Vertebrata it is due to the time-regulated discharges of nerve-force in certain of the ganglia in and near the substance of the heart, by which discharges the muscular walls are excited to contraction.
2. In Invertebrata, the corresponding pulsatile movements of hearts or vessels are probably independent of nerve-force.
3. The time-regulated rhythmic action, whether of the nervous centres or of the independent contractile walls, is due to their nutrition being rhythmic, *i. e.* to their being, in certain periods, by nutritive changes of composition, raised, with regulated progress, to a state of instability of composition, in their decline from which they discharge nerve-force, or change their shape, contracting.
4. The muscular substance of the heart in the Vertebrata, governed in its rhythmic action by appropriate nervous centres, has a rhythmic nutrition of its own, corresponding and coordinate with theirs; the impairments of its structure during action being repaired in repose.
5. Rhythmic nutrition is a process in accordance with the general laws of organic life, very many organic processes being composed of timely-regulated alternate action and inaction, or alternate opposite actions, *i. e.* being rhythmical, with larger or shorter units of time; and all organic processes being chronometric, *i. e.* ordered according to laws of time as exact, and only as much influenced by external conditions, as are those relating to weight, size, shape, and composition.—*Proc. of Roy. Soc.* May 28, 1857.



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