characteristic, seeing that the fifteen phenols tested varied greatly in this respect.

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¹ NATURE, 153, 20 (1944).

² British Patent No. 472,623 (1935).

³ J. Hygiene, 41, 121 (1941).

⁴ J. Hygiene, 40, 342 (1940).

Occurrence of Strontium in Molluscan Shells

ATTENTION was recently directed to the possible role of small quantities of strontium carbonate in promoting the formation of aragonite, rather than calcite, in certain molluscan shells¹. At that time the presence of traces of strontium had been demonstrated in only a few species of bivalves with aragonite shells (namely, *Tellina tenuis*, T. (*Macrotoma*) *baltica* and *Donax vittatus*), while the absence of strontium from some examples of the calcite shell of *Ostrea edulis* was also recorded.

I have lately had an opportunity of examining spectroscopically the occurrence of strontium in a number of other shells. It may be useful to record these results. The presence of strontium has been noted in the aragonite shells of the following species: *Venus gallina*, Gower, South Wales; *Lutraria elliptica*, Clyde; *Ceratisolen legumen*, South Wales; *Arca tetragona*, Naples (traces only); *Macra stultorum*, South Wales (traces only); *Tellina fabula*, Aberdeen (traces only); *Cyprina islandica*, Clyde; *Pholas crispata*, ? Clyde; *Tapes aureus*, West Loch, Tarbert; *Dentalium entalis*, ? Inner Hebrides; *Nautilus* sp.; *C. edule*, Fairlie, Clyde, Scilly Isles, South Wales (traces only); *C. edule*, Cannes (more distinct).

No evidence of strontium was observed in the following aragonite shells: *Cardium echinatum*, Clyde; *Nucula tenuis*, Clyde; *Unio* sp., New Zealand; *Dreissensia polymorpha*, canal at Possil, Glasgow.

No evidence of strontium was obtained in the calcite shell *Anomia ephippium* from the Clyde. Slices of two species, *Mytilus edulis* from the Clyde, and *Pecten varius* from the Clyde, which include layers of both calcite and aragonite were examined, the layers being crushed together. No trace of strontium was obtained in either species.

It may be concluded that small traces of strontium are commonly found in shells consisting of aragonite, but that its occurrence is not universal, and though it may be one of the factors leading to the formation of aragonite, other factors must also be involved. Comparatively few calcite shells have yet been examined, but no evidence of strontium has been obtained in any of them.

My thanks are due to Prof. E. Hindle and Mr. R. Elmhirst for some of the material examined, and to Prof. J. W. Cook for facilities for spectroscopic examination.

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¹ Trueman, E. R., J. Roy. Mic. Soc., 62, 69 (1942).

Achilles and the Tortoise: a Variant

ZENO's famous paradox might perhaps be used in the following way to enliven young aspirants condemned to listen to a bald narration of the peculiar virtues of the exponential function. Assuming Achilles to give the tortoise a flying start of 10 units and to move always ten times as fast as the tortoise, every schoolboy (untroubled by the infinite divisibility of space and time that formed the basis of Zeno's argument) knows that Achilles will overtake the tortoise when the latter has moved $1\frac{1}{2}$ units from its starting-point, and that this result is independent of the absolute and constant speeds of Achilles and the tortoise. Now for the enlivenment (?). Let us suppose that both Achilles and the tortoise suffer from immediate and continuously increasing fatigue, in such a manner that $v_T = pe^{-\lambda t}$, $v_A = 10pe^{-\lambda t}$. It will be observed that the initial ($t = 0$) speeds are p and $10p$ respectively, and that Achilles *always* moves ten times as fast as the tortoise (p and λ are finite positive constants, t denotes time from the start, and the suffixes A and T refer to Achilles and the tortoise respectively). Supposing Achilles to give the tortoise a flying start of 10 units, and t_m to be the time interval from the flying start when Achilles overtakes the tortoise; then

$$10p \int_0^{t_m} e^{-\lambda t} dt - p \int_0^{t_m} e^{-\lambda t} dt = 10. \quad \text{This equation reduces}$$

to $e^{-\lambda t_m} = \frac{9p - 10\lambda}{9p}$, so that $t_m = \infty$ if $9p = 10\lambda$ or

$\lambda = 0.9p$. Hence, if the latter relation holds between the constants λ and p , Achilles will, in ordinary language, never overtake the tortoise. It will be observed, however, that even in the infinite limit, the distance traversed by the tortoise would still be $1\frac{1}{2}$ units, since this distance is p/λ when $t_m = \infty$. In order to avoid undue levity among the aspirants, it might be better to substitute a second tortoise for Achilles.

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Post-War University Education

MR. HARDIE's valuable letter in NATURE of January 8 mentions the proposal of the British Association Committee on Post-war University Education that English universities should offer, in addition to the existing specialized Honours Schools, a general honours course in "philosophy, natural and social". Mr. Hardie truly observes that the new discipline would not solve the difficulty of ensuring that students in existing honours groups should acquire "a more balanced and mature mental outlook". But the Committee is now engaged upon this problem; and the draft of a section of its final report, suggesting how the problem might be solved, is to be considered at the next meeting of the Committee. This draft has a good deal in common with Mr. Hardie's own proposal.

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