Table 1. Growth determined turbidimetrically (optical density × 10)

Vitamin or growth factor	Basal medium* plus Peptone	Na nitrate	Arginine	Proline
None	28·0	0·9	1·5	1·4
B_1	—	5·0	55·5	62·0
B_2	—	3·2	11·8	7·2
B_6	—	3·0	15·0	8·0
Biotin	—	3·5	17·0	8·8
Folic acid	—	3·3	10·3	11·5
Calcium pantothenate	—	1·1	1·4	1·5

* Basal medium : glucose, 34 gm. ; KH_2PO_4, 5 gm. ; $MgSO_4.7H_2O$, 2·5 gm. ; $FeSO_4$, 0·01 gm. ; water, 1,000 ml.

Table 2

Medium	Growth* (gm.)	Increase over basal medium (per cent)
Basal medium†	0·040	—
Basal medium + peptone	0·049	22·5
Basal medium + B_1	0·056	40·0
Basal medium + peptone + B_1	0·058	45·0

* Dry cells weight. Each result is the average of three experiments.
† Basal medium as in Table 1 with 2·05 gm. of L-proline.

Protothecae have already a heterotrophic metabolism, like certain fungi and bacteria.

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Thorium-bearing Minerals in New Zealand

In the course of a comprehensive study of the opaque mineral sands of New Zealand, the occurrence of thorium-containing minerals of medium density has been noted in the Westport area. Dr. C. O. Hutton, of Stanford University, California, has identified the principal minerals responsible as thorium-bearing sphene and the epidote allanite (private communication).

That part of a fairly crude magnetically separated fraction that sank in bromoform, s.g. 2·8, but which floated in methylene iodide, s.g. 3·3, analysed 0·1 per cent thorium oxide by chemical methods. (Analysis of the thorium oxide was carried out by the Dominion Laboratory.) The ratio of the weight of this fraction in the sample studied to the weight of ilmenite contained was approximately 1 : 7.

D. S. Nicholson[1] has roughly estimated that from surface indications there could be some 90 million tons of sand containing some 5 million tons of ilmenite in the area. It is assumed, but has not been established, that the thorium-containing minerals occur throughout the deposits.

It is understood that neither mineral is a commercially acceptable source of thorium to-day.

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A Through-conducting System co-ordinating the Protective Retraction of *Alcyonium* (Coelenterata)

Although Milne-Edwards[1] and Hickson[2] report the existence of co-ordination between the polyps of *Alcyonium*, there is very little to be found in the literature beyond this bare record. Kassianov[3] comes to the conclusion that there is no colonial nervous system in *Alcyonium*. Kukenthal[4] states that in Alcyonaria the existence of a colonial nervous system must be inferred from (presumably mechanical) stimulation experiments. On the other hand, Hyman[5] concludes that "in most Alcyonarians a nervous plexus seems to be absent from the wall of the anthocodia and the general coenenchyme", except that "the occurrence of such a plexus in the coenenchymal epidermis has been verified for *Veretillum* and may be expected in many Pennatulacea".

The use of electrical stimulation has recently revealed a through-conducting system which co-ordinates the protective retraction of polyps in several groups of Octocorallia. In *Alcyonium*, *Solenopodium*, *Tubipora* and some colonies of *Heteroxenia*, a single electrical stimulus produces no contraction of the polyp columns, though tentacles anywhere on the colony may respond with a jerk. A second stimulus applied anywhere relative to the first initiates a wave of contraction of the tentacles and columns of all the polyps of the colony. This experiment shows that the first stimulus produces a state of excitation over the whole colony, though without a visible reaction. By progressively shortening the interval between the two shocks until the second produces no effect, the refractory period of the through-conducting system has been measured in some instances. For the following Red Sea species at 25°–26° C. the refractory periods were : *Heteroxenia*[6], 0·08 sec. ; *Tubipora*[7], 0·02 sec. ; *Solenopodium*[8], 0·05–0·1 sec. In the cold-water species *Alcyonium digitatum* it was 0·15–0·2 sec. at 16°–17° C.

However, there could be a localized effect of successive stimuli in addition to the above straightforward through-conduction. To test this possibility in *Alcyonium*, a comparison has been made between the contraction of the polyps in response to eight shocks at 1-sec. intervals applied to the same point, and eight shocks at 1-sec. intervals applied to widely separated points. Eight shocks are a convenient number because they produce a large but incomplete retraction. A difference in degree of contraction over the colony would have implied a summation at the one point, but in fact no difference has been found in twenty-five to thirty small colonies tested. The same experiment carried out on *Sarcophytum* has quite a different result. Summation of several electrical stimuli at one point is there essential before through-conduction is initiated[7]. In large colonies of *Alcyonium* (greater than 15 cm. long) through-conduction may not be complete, because it has been noted that even in small colonies through-conduction sometimes fails between lobes.

The histological basis of the through-conducting system of *Alcyonium* has not been identified directly. An old controversy concerning the existence of nerve cells in the mesoglœa appears to have been settled by Kassianov[3], who describes a nerve net only in the walls of the endodermal tubules, not in the mesoglœa or the ectoderm of the syndete. There is no indication that this histological endodermal net entirely