on the antigenic structure of bacteria by the application of the phagocytic reaction.

The experiments shed some light on the efficiency of the mechanism of phagocytosis depending on the character of infecting bacteria. They also suggest the importance of an as yet unknown factor, contained in the normal horse serum, for the phagocytic process of smooth bacterial forms.

The phagocytic test proved to be more sensitive than serological reactions in the detection of differences in the antigenic structure of bacteria (for example, in the detection of transitional forms).

S. Ślopek
A. Skurski
E. Michalska
L. Dabrowski

Department of Bacteriology,
Institute of Immunology and
Experimental Therapy,
Polish Academy of Sciences,
Wrocław.
July 7.

Longevity of *Proteus* Group of Amœbæ

Explanation (1) of the findings described by Muggleton and Danielli[1] appears to fit in best with the facts enumerated below.

The normal life-cycle of the *Proteus* group of amoebae consists of four well marked stages: (*a*) spore, (*b*) developing juvenile, (*c*) adolescent, (*d*) mature to senile. It is the adolescent and young adult that can be made to reproduce indefinitely by binary fission. As soon, however, as a rigid control of their environment is relaxed, they proceed with their life-cycle. Chromidia from the nucleus escape into the cytoplasm and develop into spores. When the individual becomes filled with spores it dies. If, however, these spore-filled individuals are placed in a Petri dish and killed by a change in *p*H, the hatching of the spores, and their subsequent development, given a suitable pabulum, can be observed. It has been shown why this development is slow[2]. I am at present engaged in trying to accelerate this growth, and am glad to record here the gift of supplies of bacteria and lettuce-water sent to me by Dr. Muriel Robertson of the Lister Institute.

Monica Taylor

Notre Dame Convent,
Dowanhill,
Glasgow, W.2.
July 31.

[1] Muggleton, A., and Danielli, J. F., *Nature*, **181**, 1738 (1958).
[2] Taylor, M., Hayes, C., and Galbraith, M., *Proc. Roy. Soc., Edin.*, B, **66**, Part III, No. 15 (1957).

Growth and Maturity of the Barnacles *Lepas hillii* and *Lepas anatifera*

Information on the rate of growth of all species of *Lepas* is scanty. Stanley Kemp, in a letter to J. F. Anton[1], quotes three sources, the first of which, referring to an unspecified *Lepas*, gives an increase in capitulum length of about 1 mm. a day; the second and third, referring to *L. anserifera*, give increases of 8 mm. in 8 days, 21 mm. in 40 days and 25 mm. in 107 days. In all cases these are minimum rates since they refer to ships and to a buoy known to be free of barnacles at one date and supporting barnacles of quoted size at another, the moment of settling being unknown.

During the voyage of the yacht *Petula* from Dakar to Barbados in the winter of 1953–54 [2], colonies of barnacles settled on the ship's side above her anti-fouling paint and flourished there throughout the passage. While the ship lay in Dakar harbour preparing for sea, the stores which were loaded into her so increased her draught that some of her white topside paint was submerged, and here many fouling organisms were able to gain a hold. So long as the ship was at anchor only the sessile barnacle *Balanus amphitrite* Darw. was present, but at sea this species largely died off and was replaced by the pedunculate barnacles *Lepas hillii* Leach, *Lepas anatifera* L. and *Conchoderma virgatum* (Spengler). *Conchoderma virgatum* was present in large numbers and early attained a capitulum length of 9 mm. but beyond this length it did not grow, being heavily preyed upon by the trigger fish *Canthidermis maculatus* and *C. sobaco*.

In position 15° N., 31° W., after the ship had been at sea for 30 days, a sample of twenty of the largest *Lepas* growing on the topside was taken and preserved. A further sample of sixty of the largest specimens from an adjacent position was taken after 60 days, in position 15° N., 46° W.

Measurement of the preserved material yielded results summarized in Table 1. The measurements, to the nearest 0·5 mm., were made from the umbo (basioccludent angle) of the scutum to the upper (occludent) tip of the tergum. This dimension may be approximately equated with the capitulum length generally quoted in the literature, being very slightly greater; it is to be preferred to the capitulum length as giving a firmer standard of size.

Table 1. Length Distribution of *Lepas* taken 30 and 60 Days Out

	Length (mm.)	11–13·5	14–16·5	17–19·5	20–23
30 days	Total *L. hillii*	3	4	2	0
	Gravid *L. hillii*	0	1	0	0
	Total *L. anatifera*	5	6	0	0
	Gravid *L. anatifera*	0	2	0	0
60 days	Total *L. hillii*	6	10	20	21
	Gravid *L. hillii*	0	2	16	11
	Total *L. anatifera*	0	0	1	2
	Gravid *L. anatifera*	0	0	0	1

The age of the barnacles in the samples is again not known with certainty since settlement on the ship's side was not observed. Colonies containing both species of *Lepas* were established 10 days out, with capitula of perhaps 5 mm., and from the first day out the ship passed among much flotsam bearing mature *L. anatifera* from which infection by this species could have occurred. No *L. hillii* were found on collected flotsam, yet it is certain that both species were well established on the tenth day and it is not unreasonable to suppose that settlement of both began very near to the start of the voyage.

All specimens were opened and searched for embryos. From Table 1 the following may be noted.

(*a*) Among the 30-day group only one specimen of *L. anatifera* among eleven and one of *L. hillii* among nine bore embryos in the ovigerous lamellæ. It therefore seems probable that both species require more than 30 days on average from settlement to maturity.

(*b*) Of the 60-day group of *L. antifera* one out of three bore embryos. Twenty-nine out of fifty-seven *L. hillii* bore embryos, all except two of the gravid examples being longer than 16·5 mm. So large a proportion of the barnacles between 17 and 19·5 cm.

contained embryos that it is probable that this span represents first maturity. Since *L. hilli* achieved, in general, a length of 13–17 mm. in 30 days, 17–19·5 mm. at maturity and 17–21 mm. in 60 days it might be crudely assumed, given a constant increase in length during the second month, that maturity was achieved, on average, in the last two weeks of the second month. Comparing lengths at 30 and 60 days, however, it is seen that the average daily increase of about 0·5 mm. in the first month is not maintained in the second. This check in growth was no doubt due to the attainment of maturity at 17–19·5 mm. It would therefore seem more probable that the growth-rate of 0·5 mm. a day observed in the first month continued to maturity, which on these terms occurred in general on the thirtieth to forty-third day. Thereafter, a growth-rate near 0·03 mm. a day is indicated.

Throughout the voyage the sea temperature was high, ranging from 24·2° to 26·1° C. The conclusions advanced above concerning both growth-rate and the length of the juvenile phase must consequently be applied with caution to animals taken in cooler waters.

Frank Evans

Dove Marine Laboratory,
Cullercoats,
Northumberland. Sept. 1.

[1] Anton, J. F., *Scot. Nat.*, **61**, 65 (1949).
[2] Evans, F., *J. Inst. Navig.*, **8**, 205 (1955).

Occurrence of Forms of *Fucus distichus* L. emend. Powell on North Rona and Sula Sgeir

Fucus distichus L. emend. Powell is an extremely polymorphic alga, widely distributed principally on arctic and sub-arctic coasts, and I have recently proposed[1] the recognition of four principal subspecies of this plant. Two of the subspecies—subsp. *edentatus* (De la Pyl.) Powell (a large plant of sheltered shores), and subsp. *anceps* (Harv. et Ward ex Carruthers) Powell (a small plant of exposed shores)—have southern limits in northern and western parts of Scotland and Ireland[2], and are the rarest fucoids in Britain.

As a member of the Glasgow University North Rona Expedition (June 23–July 23, 1958)[3], I have recently been able to investigate the botany and littoral ecology of the small, remote Scottish islands of North Rona and Sula Sgeir which lie about 45 miles north-west of Cape Wrath. Subsp. *anceps* was found on both islands, in small quantity but at several sites in each case, at its usual high level on shores exposed to severe swell and wave action. Subsp. *edentatus* was found on North Rona only, in the moderately sheltered inner parts of two narrow geos facing north and north-east respectively, in the north-eastern part of the peninsula of Fianuis. In the north-facing geo, only a few young (non-fertile) plants were found on large mid-littoral boulders; but in the north-east-facing geo, subsp. *edentatus* formed a distinct belt (of varying depth) in the upper half of the mid-littoral zone, along about 25 m. of shore each side of the geo, and both young (non-fertile) and older (fully fertile) plants were present. The largest plant was 42 cm. in length. Several plants of both subspecies have been examined in detail; caecostomata[1] were present in all, and the conceptacles were hermaphrodite. The only other fucoid found was *F. spiralis* L. (mostly f. *nana*)—very scarce on North Rona only.

The present findings confirm previous observations[2] that subsp. *anceps* can survive more severe exposure conditions than any other fucoid in northern Britain; and these records from such small and isolated islands strengthen my belief[2] that subsp. *anceps* is a relict plant in Britain, a survivor from a period when the climate here was colder.

Subsp. *edentatus* has been reported previously from only three localities in Britain (in the harbours of Lerwick and Scalloway in the Shetland Isles, and in the North Haven on Fair Isle)[2]; the North Rona records therefore establish a new southern limit for the plant on the British side of the North Sea. I have suggested elsewhere[2] that subsp. *edentatus* may have been introduced to the Shetland and Fair Isle localities within recent centuries, perhaps by fishing boats; but it seems scarcely likely that it could have been introduced to North Rona in this way, even though we saw as many as four Norwegian fishing boats at a time anchored close inshore there during periods of rough weather. The possibility of introduction by floating plants cannot be ruled out, of course, but this seems not very likely in view of the prevailing winds and currents. There remains the possibility that subsp. *edentatus* has been present on North Rona, and perhaps at the other three Scottish localities, a very long time—a relict plant, as subsp. *anceps* appears to be; I now much incline to this view.

A detailed report on the littoral flora and fauna of North Rona and Sula Sgeir is being written in collaboration with my colleague Mr. T. B. Bagenal, and will be published elsewhere.

H. T. Powell

Marine Station, Millport,
Isle of Cumbrae, Scotland.
Aug. 26.

[1] Powell, H. T., *J. Mar. Biol. Assoc. U.K.*, **36**, 407 (1957).
[2] Powell, H. T., *J. Mar. Biol. Assoc. U.K.*, **36**, 663 (1957).
[3] Bagenal, T. B., and Powell, H. T., *Nature*, **182**, 775 (1958).

Selection of Cell Lines in Tissue Culture by the Use of Cytotoxic Antisera

The cytotoxic action of antisera against nucleoproteins isolated from HeLa, H.Ep. No. 1 and MCN cells has been previously reported from this laboratory[1,2]. Of particular significance was the observation that only cell lines exhibiting epithelial-like morphology (Ep. L) were destroyed by the HeLa and H.Ep. No. 1 antisera, while cells with fibroblast-like morphology (Fb. L) were affected only by the MCN antisera. Consistently, cultures of susceptible cells were completely destroyed by a 1 : 50 dilution of cytotoxic antisera in the presence of guinea pig complement. During the course of these investigations, an established strain of human amnion cells was encountered the behaviour of which toward HeLa and MCN antisera was different from that of cell lines previously examined. A fraction of the cell population was resistant to the MCN antiserum and a fraction was resistant to the HeLa antiserum, even when the antisera were employed at 1 : 4 dilution. It is the purpose of this communication to report the selection of two cell lines from the human amnion strain. These two sublines can be distinguished on the basis of their morphological characteristics, their capacity to support virus multiplication, and their sensitivity to the HeLa and MCN antisera.

The human amnion strain was obtained through the kindness of Dr. L. Hayflick from the Tissue Culture Laboratory of the University of Texas,