(twenty days in the oven) either were incapable of laying down the growing point or developed deficient or abnormal leaves; in the second and third lots none went beyond the cotyledon stage and all died after thirty to forty days. The development of the roots was equally affected; more than fifty per cent of the seedlings of the first lot had roots incapable of development owing to the early death of the growing point; some of them, however, developed lateral roots at a later stage. None of the seedlings of the second and third lots possessed roots capable of development.

A considerable number of the surviving young plants displayed in the course of development various abnormalities of leaf shape, etc., some later assumed a normal appearance.

Parallel experiments with X-rays have shown that an effect similar to that obtained by placing seeds in the oven at 54°–55° C. for twenty days is produced by subjecting dry seeds to a dosage of 15,000 r.

Cytological investigation of the root-tip material from the plants at the age of forty-two days revealed, according to expectation, a great number of chromosomal translocations; the mutant plants were, of course, chimæras.

The effect of moderate heat between 50° C. and 60° C. acting for twenty days upon dry seeds of *C. tectorum* thus proved to be comparable to that of ageing by keeping them at room temperature from six to seven years.

The results of this experiment clearly lead to the conclusion that heat acting upon 'resting' seeds must be an important factor in increasing the rate of mutation, both under natural conditions and in agriculture. More extensive experiments, including the study of the effect of the natural heat of the sun, are under way. A detailed report will follow.

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July 25.

[1] M. Navashin, NATURE, 131, 436, March 25, 1933.

Disappearance of *Zostera marina*

As an old student of marine biology I have read Mr. A. D. Cotton's letter in NATURE of August 19 with interest.

The reduction of growth of *Zostera marina* over such a wide geographical area is a matter of serious economic importance, and would appear to be a problem not easily solved, on account of the number of local environmental conditions requiring close attention.

In so far as the English Channel is concerned, I cannot help wondering, in the light of inshore collecting experiences during the last ten years, whether the menace of the crude oil waste from ships and motor-boats may not be a factor worth considering. From Dymchurch Bay to Looe, my experience has been that many inshore collecting grounds for marine invertebrate fauna which in pre-War days yielded an abundant supply of material, do so no longer owing to the continued growing contamination from oil waste that has taken place during the last ten or twelve years. It would be interesting to ascertain whether an appreciable amount of oil waste sludge is present in the mud on the affected *Zostera* beds, and a chemical analysis of the mud content from affected and non-affected areas might very well prove illuminating.

I know that in certain quarters opinions are sharply divided on the question of the menace from oil waste, and therefore I put forward my suggestion tentatively, but practical experience points to a growing evil.

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Aug. 19.

THE factor of crude oil waste has naturally been considered in connexion with the remarkable disappearance of *Zostera marina*, and a comparative analysis of samples of mud is being undertaken. There are three reasons, however, which render it difficult to believe that excessive oil-pollution is the cause of the phenomenon: (1) the suddenness of the disappearance of the plant over such a very wide area; (2) its *general* disappearance over this wide area irrespective of the degree of oil-pollution; and (3) the continued existence of *Zostera* beds for many years in areas believed to be heavily polluted. An instance is quoted by Dr. H. F. Lewis, moreover, of *Zostera marina* remaining unharmed in an area in the St. Lawrence where an oil tanker had been wrecked and heavy crude oil pollution occurred. It is of interest to note that in Europe, as in the United States, *Zostera nana* is still abundant and apparently quite healthy.

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Aug. 31.

X-Radiation and the Allantoic Membrane of the Embryo Chick

C. M. SCOTT[1] has published a criticism of my claim of an antagonistic action of X-radiation on the allantoic membrane of the embryo chick[2]. He obtains mixed ray reactions in half an hour with a dose of 600 r. and homogeneous ray reactions in 2–3 hours with a dose of 2 r. He concludes that there is no difference in action but that the membrane reaches a critical state of sensitivity after 2 to 3 hours' exposure of the 'window' to the air.

Scott's conclusion breaks down because homogeneous ray reactions may be obtained in half an hour or less, given suitable wave-length, intensity and homogeneity. His failure to obtain results with short exposures appears to be due to the fact that he used the whole *K* spectrum of tungsten, a radiation of unsuitable wave-length and insufficient homogeneity.

Scott also claims to have obtained atrophic reactions of the allantoic membrane with feeble mixed rays. His mixed radiation, however, comprises the same spectral region as his homogeneous radiation, and as similar absorption coefficients are quoted, one must conclude that both feeble radiations are substantially the same.

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July 19.

[1] *Proc. Roy. Soc.*, B, **112**, 365.
[2] *Proc. Roy. Soc.*, B, **105**, 402; B, **107**, 293.