

per cent was lost in less than 2 hr. in group I, in 4-5 hr. in group II, and in 7 hr. in group III.

In further experiments the same range of doses of the insecticide dieldrin was fed to each of two groups of hoppers which had been starved for a period of 24 hr. The insecticide was applied to a small portion of a blade of grass, and within 15 min. of eating this the hoppers of one group were supplied with abundant freshly cut grass. No deaths occurred within five days among the 56 insects in this group. The second group was kept without food for a further 24 hr. after dosing and a total of 48 deaths occurred during the next five days from the 55 insects that were dosed. These results corresponded to LD_{50} 's of ≥ 4.8 and $0.79 \mu\text{gm./gm.}$ respectively. In the second experiment similar results were obtained, that is, LD_{50} 's of ≥ 4.8 and $0.95 \mu\text{gm./gm.}$

Pearson's toxicity results clearly fit in with these findings. His normal treatment most nearly followed group I above, since his insects "were not fed on the previous evening" but were fed immediately after dosing, while his starvation treatment was equivalent to group III. As a result of the different treatments the resistance of the insects fed immediately after dosing was increased 1.5-2.8 times.

It is interesting to note that what might appear to be a convenient laboratory procedure may yield very variable results. For example, locusts may be deprived of food for 24 hr. before a stomach toxicity experiment is due to be carried out and then given the poisoned food. Later, when convenient, they are supplied with abundant grass; if this occurs immediately after the poison is consumed, the toxicity will be very much less than if there is a delay of a few hours, as may well occur when a large series of individuals is being treated.

In the field, Ellis and Ashall⁴ found that in some cases hoppers exhibited a noticeable diurnal rhythm in feeding, there being least feeding during the 6 hr. after dawn, and most between 1600 and 2200 hr. It is thus probable that when dieldrin is sprayed on vegetation, a technique being used on an increasing scale⁵ for locust control, its toxicity will vary with the time of day at which it is eaten.

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Fertilization of Eggs of the Desert Locust by Spermatozoa from Successive Copulations

IN the desert locust (*Schistocerca gregaria* Forsk.) copulation occurs frequently, although once fertilization has taken place further copulation appears to serve mainly as a stimulant to egg-laying and to be unnecessary for renewed fertilization¹. An interesting problem arises as to whether, after a second copulation, eggs are fertilized by sperm from the first or the second copulation. The following experiment was

devised, using an albino stock of *Schistocerca*. It has been shown previously that crosses between albino and normal adults show a Mendelian pattern of inheritance, in which albinism is recessive².

Four pure albino females were kept in isolation in cages, and when they were sexually mature an albino male was introduced into each cage for 24 hr. and then removed. Subsequent oviposition produced averages of 60-80 young locusts per egg pod, and these included both males and females, showing that copulation had taken place. After each albino female had laid two egg pods, from which only albino hatchlings resulted, a normal-strain male was placed with each of the females and then removed after 24 hr. All subsequent egg pods produced young locusts that were normal in appearance, to the almost complete exclusion of albinos. In fact, out of 1,033 eggs that hatched, 1,028 were normal and five were albino. In a further experiment, the same procedure was adopted except that the albino female was fertilized first by a normal male and then by an albino; the progeny of the first two pods were all normal in appearance, but after the second copulation all, without exception, were albino.

It is known that spermatozoa can fertilize eggs at least ten weeks after the last copulation¹, but from the present experiments it appears that a second injection in some way prevents further use of the previous spermatozoa. This is evidently not due to competition between a more and a less virile strain, as it occurred whether the albino or the normal male was used second. Whether the first spermatozoa were inactivated in some way, or even killed, by the second, or the second spermatophore mechanically prevented the first spermatozoa from reaching the eggs, cannot be deduced from these observations.

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OCEANOGRAPHY

Manganese Deposition on the Shells of Living Molluscs

RECENTLY, there has been a renewal of interest in manganese deposition on the sea bed, particularly that brought about by biological rather than inorganic processes¹⁻⁵. During the past fifty years¹⁻¹⁴ various theories have been put forward concerning the method of manganese deposition, yet the only measurements on the rate of deposition are those of Pettersen^{11,12}, and Buttler and Houtermans¹³ on manganese nodules of deep-sea origin. These authors give a rate of the order of 1 mm. in 1,000 years.

During a survey of the sublittoral fauna of the Clyde sea area from 1949 onwards, it has been observed that the shells of many living molluscs are encrusted with a black deposit. In particular, this was the case of molluscs taken from muds and sandy-muds at depths of 15-105 fathoms. Although this has been recorded before^{7-9,15}, past analyses were limited to nodules, and deposits on stones and empty shells. While many species of living molluscs in the Clyde have manganese deposited on their shells, it is significant that deposits are more common and much heavier on shells with a dull, matt periostracum than on those with a glossy periostracum.