weeks after treatment and in normally developing fruit. All ovaries developing as a result of GA treatment were examined for parthenocarpy. The data in Table 1 are the average curvatures with standard errors for groups of 8 to 10 flowers. They show that the growth of the ovary treated with GA corresponds closely with the growth after pollination and fertilization and the levels of diffusible auxin are not significantly different. Again there is no significant difference in the amount of diffusible auxin after treatment with the two concentrations of GA.

Thus, the stimulus of pollination in fruit growth arises from a gibberellin in the pollen which results in the production of diffusible auxin in the ovary tissue. An extract of 8 grams of fresh stamens of tomato was made by the procedure of MacMillan *et al.* (*8*) as modified by Lang and Reinhard. Initial extraction was made with methanol at 5° to 7°C. The methanol was then evaporated and the residue was acidified (*p*H 3) with 5*N* HCl, saturated with NaCl, and extracted with ethyl acetate. The ethyl acetate fraction was extracted with a buffer of *p*H 8. The water phase was acidified and extracted repeatedly with ethyl acetate. The ethyl acetate was then evaporated and the residue was dissolved in 4 ml of water. Maize seedlings, dwarf-5 (from seed kindly supplied by Dr. B. O. Phinney), were treated with 0.2 ml of the crude extract and its dilutions to determine the presence of gibberellin-like substances (*9*). Treatment with the extract induced an elongation of 13.0 mm in the first leaf sheath of the seedlings corresponding to an equivalent GA concentration of $1.3 \times 10^{-5}M$. The elongation after treatment with the extract diluted 10 times was 5.4 mm corresponding to $5 \times 10^{-7}M$ GA and after treatment with the extract diluted 100 times the elongation was 2.9 mm corresponding to $9 \times 10^{-8}M$ GA. The amount of gibberellin-like substance in the stamens is 11 μg per gram, fresh weight.

The gibberellin-like substance of young developing seeds (*10*) similarly may have an effect on the production of auxin by such seeds during fruit growth (*11*). The effect of GA on the mechanism for auxin production in the ovary (*12*) is still under investigation.

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Olfactory Epithelium: Unitary Responses in the Tortoise

Abstract. *In the tortoise,* Gopherus polyphemus, *single unit spikes in the olfactory epithelium in response to amyl acetate were positive relative to the slow potential. The number of spikes in a response train was 4 to 15, the duration 3 to 4 msec, the height 0.5 to 2 mv. The height of successive spikes in a train decreased. The decrement in height, the number, and the frequency of spikes changed with the strength of the odor.*

Recently a few workers began to study the activity of single receptor units in the olfactory epithelium with microelectrodes (*1–3*). Gesteland (*3*) stated that specially designed metal microelectrodes were necessary for recording spikes from the olfactory epithelium.

In our experiments on single unit responses of the olfactory epithelium, we found spike discharges in response to odor clearly by microelectrodes filled with 3*M* KCl. The tortoise, *Gopherus polyphemus,* was used to compare the results with those of Tucker (*4, 5*), who studied responses of olfactory nerve twigs. The tortoise was anesthetized with ethyl urethane, and its head was stabilized by a holder. After parts of the skin, bone, and cartilage over the olfactory cavity had been removed, a small hole 5 mm in diameter was made in the dorsal olfactory mucosa. The olfactory epithelium was about 0.4 to 1.0 mm thick and its color ranged from yellow to brown. The microelectrode, less than 1 μ in tip diameter and filled with 3*M* KCl, was inserted with a micromanipulator through the hole into the olfactory epithelium on the septal wall. Odors of various strengths were applied to the epithelium through 1 mm Teflon tubing from a syringe or through glass tubing from a continuous flow olfactometer.

The slow potential produced by olfactory stimulation was always negative, as was that of frog and toad (*2, 6*). Its height decreased gradually as the tip of the microelectrode was lowered from the surface of the mucus to the basal membrane. In one experiment the height of the slow potential was reduced by half at a depth of 200 to 250 μ (1/10 amyl acetate). Spike discharges of a single receptor unit in response to odor were positive relative to the slow potential (Fig. 1*A*) and were monophasic or diphasic in shape. The height of spikes was 0.5 to 2 mv, and the duration was 3 to 4 msec. The number of spikes discharged by one odorous puff was usually 4 to 15, and the spike heights decreased in succession (Fig. 1*A* and *B*). Spikes were recorded stably for about 1 hour. The decrement of spike height, the number of spikes per stimulus, and the average frequency all increase with the increasing strength of the odor (Fig. 2).

For example at amyl acetate concentrations of 1/100, 1/50, 1/10 (fraction of saturation), which gave odors of different strengths, the average frequency of spikes per second was 7.8, 8.3, and 14.0, respectively.

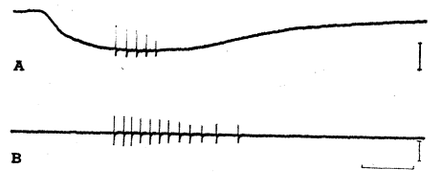

Fig. 1. Single receptor unit response of the olfactory epithelium. *A*, Response recorded through d-c amplifier; 0.5 ml puff of 1/50 amyl acetate. *B*, Response recorded through a-c amplifier; 0.5 ml puff of 1/10 amyl acetate. Calibrated voltage, 1 mv; time trace, 0.5 second.

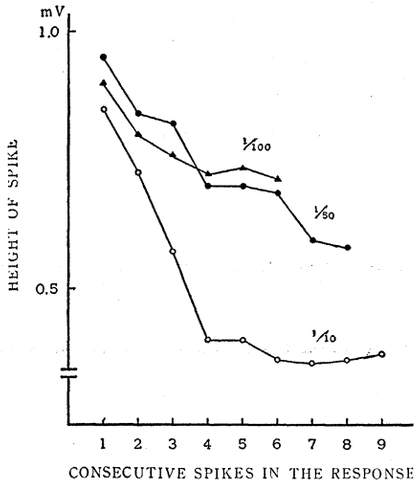

Fig. 2. Decrement in the height of spikes obtained in response to various concentrations of amyl acetate vapor for the same unit.

Odors of *n*-amyl alcohol, *n*-butyl alcohol, florida orange, spike lavender, and clove leaves were used as stimuli. The height of spikes decreased gradually, as did the response to amyl acetate, when high concentrations of these odors were used. When three different odors (all 0.5 ml puff of 1/50) were applied to the same single unit, the average frequency of spikes per second was: amyl acetate 13.0, florida orange 14.1, spike lavender 16.3. No great specificity to odor qualities was observed.

When a 30-second stimulation with amyl acetate was applied, spike height recovered after the initial spikes had decreased in height or had temporarily disappeared, and the newly maintained steady-state frequency was usually lower than that of the initial spikes. In many experiments spontaneous spike discharges were recorded which were inhibited suddenly or accelerated in frequency by olfactory stimulation. Tucker (*4*) reported that with long odor stimulation (0.5 to 1 minute) of the olfactory epithelium, a short phasic response was followed by a steady-state activity of the olfactory nerve twig which was maintained until stimulation ceased.

It is presumed that these positive spike discharges in response to odors were led from the olfactory cell body rather than from its axonal extension. However, why the spike height should decrease so strongly with increase in spike frequency is not yet clear. The decrement of the spike height may result from a change of the membrane resistance in the receptor cell (*7*).

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Population Control in Animals by Overloading Resources with Sterile Animals

Abstract. *Sterile animals might be introduced into a population to overload a resource. As a result, some of the original fertile animals might be lost by migration or death. This process could be repeated until the fertile population was eradicated without the mating required by Knipling's models. This method may be of use in ecology and in economic control of populations.*

In economic practice a population of harmful animals is usually controlled by killing a proportion of the population. This method has also been used by experimental ecologists to study the reactions in a population when its numbers decline (*1*). But no one seems to have used the reverse method of deliberately augmenting the harmful population in order to overload a resource and thus bring about a population "crash." The results of overloading a resource are well seen in two examples, the fate of a deer population on the Kaibab plateau (*2*) and the history of the *Cactoblastis* moth introduced into Australia (*3*). The deer increased after predators had been killed; they damaged their pastures so much that the population crashed and did not subsequently reach the levels that had been maintained under predation. Similarly, *Cactoblastis* was able to increase so rapidly on a superabundant source of food (*Opuntia* cacti) that it permanently reduced both the quantity of the resource and its own numbers to levels nearer those in its original environment in America.

This method has probably not been tested against harmful animals because many of the resources which might be overloaded are also used by man. But in special circumstances this difficulty might be overcome by introducing sterile animals to overload a resource. After the crash the population would be diluted with nonbreeding animals. Repetition of the process could, in principle, lead to complete replacement of fertile animals by sterile ones.

This notion may be illustrated by hypothetical examples. Suppose that the number of animals in a natural population is kept at N_0 by a shortage of an inconsumable resource. For convenience, assume that the resource is shelter during an unfavorable season and that over the short period we are considering, birth rate and death rate equal zero. Assume also that all the shelter is fully occupied and that any animal which leaves it is lost to the population. If any animals are introduced into such a population a struggle for shelter will ensue during which the excess animals will be driven out and lost. If we introduce N_s sterile animals into this population it will settle down after the struggle with a total of N_0 animals, but of these only $N_0^2/(N_0 + N_s)$ will be fertile, the remaining $N_0 - [N_0^2/(N_0 + N_s)]$ being sterile. This conclusion depends on the further assumption that each member of the original population is equivalent to each of the sterile newcomers in the struggle for shelter.

If this "flushing" were repeated with N_s sterile animals at each flush, the population would be progressively diluted by sterile animals (see Table 1).

The efficiency of flushing should be increased by overloading a *consumable* resource. Assume that sterile animals are in such numbers that they deplete the consumable resource to a level at which it will no longer support a population N_0. During the first flush, animals will leave the population by death or emigration until the total number remaining is less than N_0. The total number of fertile wild animals among the survivors will be less than the $N_0^2/(N_0 + N_s)$ which remained in the first model.

The foregoing models are based on simple assumptions in order to illustrate the idea of flushing; they are not