Table 1. Effect of *N-m*-tolylphthalamic acid (200 ppm) applied at anthesis of the first, second, and third flower clusters on the number of flowers and fruit in successively developing clusters of the tomato

Cluster No.	Flower number			Fruit set		
	Control	Treated	Increase	Control	Treated	Increase
1	7.3	7.2	− 0.1	7.1	7.2	0.1
2	7.2	8.0	0.8	6.9	7.2	0.3
3	6.7	8.4	1.7	6.3	6.3	0.0
4	7.4	11.7	4.3	6.1	5.5	− 0.6
5	7.3	18.7	11.4	5.7	7.5	1.8
6	6.8	20.6	13.8	5.8	9.1	3.3
7	6.5	18.1	11.6	5.3	10.9	5.6
LSD 5% (Cluster × treatment)			5.4			1.5
LSD 1%			7.1			1.9

ters in June, three consecutive weekly applications of *N-m*-tolylphthalamic acid (200 ppm) were made to randomized rows in replicated blocks of all varieties. Although the normally determinate varieties were not appreciably affected, growth of the main axis of all indeterminate varieties terminated by 25 July in clusters of 50 to more than 100 flowers. This effect on flowering in the field was more pronounced than that observed in the greenhouse and resulted in delayed maturity and a decrease in total production.

Previous observations suggested that the visual effect of the chemical on flower number occurred approximately 6 wk after treatment. Since anthesis of the first flower cluster on standard tomato varieties grown at night temperatures of approximately 60°F usually occurs 6 to 8 wk after cotyledon expansion, treatment at an early seedling stage might affect the number of flowers differentiated in the first cluster. Groups of seedling tomato plants (var. Michigan State Forcing) were treated at cotyledon expansion or 1 wk later with five concentrations (50, 100, 200, 300, and 400 ppm) of *N-m*-tolylphthalamic acid. The numbers of flowers differentiated in the first clusters are listed in Table 2. Treatment at cotyledon expansion had no effect on flower differentiation, but application of 300 ppm 1 wk later showed an increase in flower number that was significantly greater than that in the controls. The number of nodes preceding the first flower cluster, however, was not altered. Although the number of flowers was also increased by 400 ppm, the main axis tended to terminate with the first flower cluster. Observations of flower number in later developing clusters established that treatment 1 wk subsequent to cotyledon expansion affected only the number of flowers in the first cluster.

Table 2. Effect of *N-m*-tolylphthalamic acid applied at cotyledon expansion and 1 wk later on the number of flowers in the first cluster of the tomato

Concentration	Cotyledon expansion	1 week after cotyledon expansion
Control	6.2	6.0
50 ppm	5.9	7.0
100 ppm	6.2	8.0
200 ppm	6.4	8.0
300 ppm	5.7	9.1*
400 ppm	5.7	9.1*
Mean	6.0	7.9†

* Differ significantly from the control at the 1-percent level.
† Difference between early and late treatment significant at the 1-percent level.

Thus it appears that, in addition to promoting fruit set of the tomato plant, *N-m*-tolylphthalamic acid may influence flower formation in later developing clusters and if applied to young seedlings will increase flower number in the first cluster. It and other *N*-arylphthalamic acids are suggested for further studies of flowering and fruiting in higher plants.

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Chalconatronite, a New Mineral from Egypt

The occurrence of a new mineral, chalconatronite, has been observed among the corrosion products of three ancient bronze objects from Egypt. The name is given in allusion to its composition as a double carbonate of copper and sodium from the Gr. *chalcos*, copper, and *natron* (Ar. *natrūn*), the modern name for naturally occurring sodium carbonate. Two of the occurrences are from the hollow interior bases of bronze figures of the Saite-Ptolomaic Period (663–630 B.C.), and the third is from the under surface of a bronze censer (Freer Gallery of Art, 52.1) of the late Coptic Period of Egypt (before 8th century A.D.). Nothing is known about the exact origin of the bronzes in Egypt, but presumably they were long buried in the earth.

Chalconatronite is found as a fine-grained, greenish-blue crust, associated with cuprite and atacamite. Chemical analysis of the product from the base of the first figure, a seated Sekhmet (lion-headed female deity) in the collection of the Fogg Museum of Art, Harvard University (No. 1943.1121a) shows the following percentages: Na_2O, 20.0; CuO, 26.8; CO_2, 29.5; H_2O, 20.4; PbO, 2.8; SiO_2, 0.5; R_2O_3, 0.6; total, 100.6. The formula is $Na_2Cu(CO_3)_2 \cdot 3H_2O$. The lead is an impurity derived from lead admixed with the parent metal, Cu-Sn bronze. The mineral is partially soluble in water with decomposition and completely soluble with effervescence in cold dilute acids.

Chalconatronite is the sixth natural carbonate to be described that contains copper as an essential constituent. These include malachite, azurite, aurichalcite, rosasite and voglite. Of these only malachite, azurite, and the present species have been observed as alteration products on ancient metal objects.

The crystals are probably monoclinic. Many are in the form of small, pseudohexagonal plates; others are lath shaped. The substance is highly birefracting and distinctly pleochroic. The optical properties are n X = 1.483 (nearly colorless), n Y = 1.530 (pale blue), n Z = 1.576 (blue); 2V large, probably positive; Z perpendicular to flattening of the crystals; Y parallel to elongation of the laths; $Z \wedge c$ apparently very small.

The hardness is low and the mineral tends to be a little chalky; specific gravity is 2.27 ± .03.

The x-ray powder diffraction pattern is sharp. The d spacings of the five strongest lines, listed in order of decreasing intensity, are 6.92, 4.17, 3.68, 2.87, and 2.42 A.

The formation of chalconatronite appears to result from the reaction of surface or subsoil waters carrying alkali carbonates in solution, either directly with the copper alloy or with intermediate alteration products, such as malachite or atacamite. Waters of this type characterize the arid regions of Egypt. Conditions in the hollow interiors of bronze objects seem to favor the formation of unusual mineral types.

Although this naturally occurring compound seems not previously to have been described, the corresponding artificial substance has long been known. A summary account of the chemistry of the synthetic compound $Na_2Cu(CO_3)_2 \cdot 3H_2O$, first prepared by Deville in 1852, is given by J. W. Mellor [*Comprehensive Treatise on Inorganic and Theoretical Chemistry*, vol. III, p. 276]. A product closely similar in chemical composition, particle characteristics, and optical properties was made in this laboratory simply by grinding in a mortar copper acetate with a saturated solution of sodium carbonate, filtering, washing, and drying. A fuller account is in preparation.

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Response of Nasal Epithelium to Odor Stimulation

An *in vitro* preparation of nasal epithelium has been developed in order to study its response to odors in a most direct manner. (This work was supported by a grant from the Armour Research Foundation and by the Research Council of Florida State University.) The opossum contains a large yellow olfactory area. A 2-cm² sheet of this tissue was carefully removed and placed in a flat lucite chamber that allowed one to dissect, under high magnification, the nerves from the richly innervated epithelium. The underside was supported by lucite except for a 1-cm² surface that could be exposed to either purified room air or one of a number of different odors.

Recordings were made from very small branches of nerves. Mechanical stimulation of the tissue resulted in very large spikes, whereas only small spikes were recorded in response to odors. These small nerves conducted spikes at about 0.4 m/sec to 1.0 m/sec. Single fibers were rarely seen to respond at a frequency greater than 8 to 15 per second.

Odors were obtained by allowing an air stream to pass over the surface of 5 ml of odorous liquid contained in a 50-ml erlenmeyer flask at the rate of 30 ml/min. A portion of this stream was allowed to diffuse into the air 1 cm below the surface of the epithelium.

Most preparations that contained a number of active fibers showed resting activity. Odors such a amyl acetate, benzene, cajeput, eucalyptus, leaf cloves, spruce, Florida orange, asafetida, 2-furaldehyde, and freshly ground coffee beans stimulated a number of such preparations, and the nerve activity increased markedly.

The percentage increase in the number of spikes per second above resting activity of a given preparation as various odors were presented for 30 sec is as follows: amyl acetate, 110; cajeput, 42; spruce, 27; Florida orange, 21; leaf cloves, 0; musk xylol, 0. A 5-min rest in purified air was given after each odor stimulation. High concentrations of amyl acetate may have a detrimental effect.

A nerve bundle containing only a few active fibers reveals that one fiber may not respond to a given odor as well as another fiber, although this relationship may be reversed if a different odor is chosen. Figure 1 shows the response of a few-fiber preparation to various odors. Note that the same fibers do not respond to all the odors.

The nasal epithelium in the olfactory region is innervated by both olfactory and trigeminal nerve fibers. The type of stimuli to which the preparation responds and the slow conduction velocity of the nerves suggest that the recordings are from olfactory nerves. On the other hand, some nerve twigs contain a few large fibers that respond to mechanical stimulation, which suggests that trigeminal nerves may be involved. For these reasons, a live-rabbit preparation was devised so that the responses to odors could be recorded from the olfactory nerves as they passed through the cribriform plate (Fig. 2). Such results were compared with those recorded from known trigeminal nerves of the same rabbit. Both of these nerves responded to most of the stimuli chosen. Therefore, the olfactory and trigeminal systems are much more similar in the type of stimuli to which they respond than was previously realized.

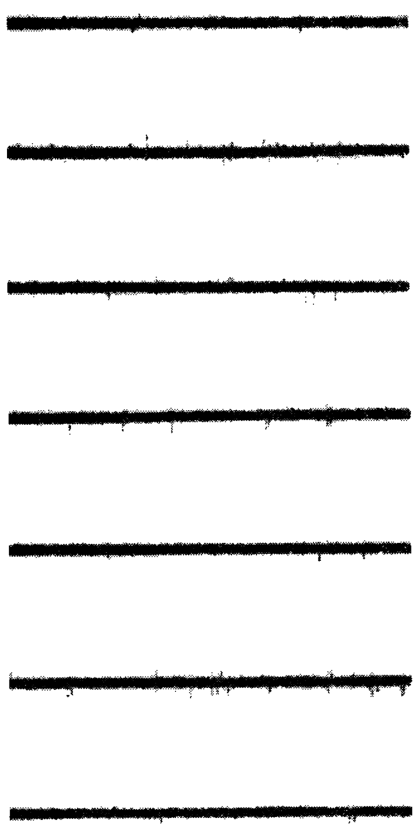

Fig. 1. The response of a few-fiber preparation to various odors. Several minutes elapse between each record. Top to bottom: air, 2-furaldehyde, air, heptane, air, coffee, air. One-half-inch horizontal space represents 1 sec.

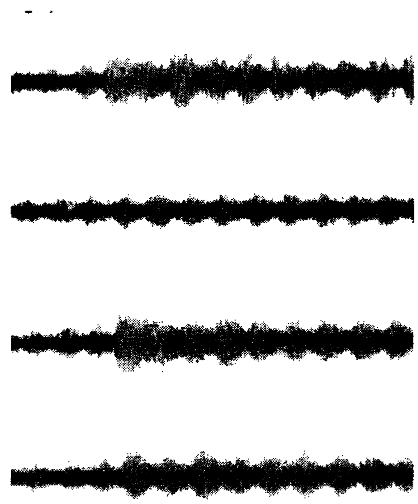

Fig. 2. Response of olfactory nerve twig to odors inhaled during breathing under anesthesia. Top to bottom: amyl acetate, benzyl benzoate, *n*-heptaldehyde, eucalyptus. One-half-inch horizontal space represents 1 sec.

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Manometer Flask for Measuring Respiratory Quotients

Although the methods presently available for measuring respiratory quotients (RQ) provide insight into patterns of metabolic changes, they leave much to be desired, both in ease of manipulation and validity of the results (*1, 2*). With these methods the measurement of changes in the RQ over extended and varying periods of time on the same tissue sample is usually impossible (*3*).

The techniques that permit the measurement of RQ rates at different or continuous intervals, such as those described by Laser and Rothschild (*4*), Noyons, (*5*), Prop (*6*), Asprey (*7*) Wolf *et al.* (*8*), and Gaffron (*9*), require elaborate equipment and considerable manipulation. Other manometer flask modifications that are used for RQ determinations measure the net oxygen uptake and carbon dioxide evolution over a period