those below. Although the two cells illustrated were cooled to 29° and 30°C, it is certainly not true that the temperature changes were always so skewed toward hypothermia. Most of the temperature changes were very similar to those used by Eisenman and Jackson (*1*), and we did not see differences in the thermosensitivity of the neurons over any particular temperature range.

The other objection raised involves the use of potassium-filled glass microelectrodes. We used these electrodes in attempting to obtain intracellular recordings with temperature changes and during the process collected data on extracellular potentials. We cannot exclude the possibility that these electrodes may have affected neuronal discharge occasionally, but it seems extremely improbable that they significantly affected the response to a change in temperature. In fact, we excluded from our series all neurons whose action potential configuration changed with time and separated all neurons whose discharge varied with time independent of temperature. Because we considered only stable recordings, we can assume that the electrode position with respect to the cell did not change with time and temperature. Since in all probability we recorded mainly from large Betz cells, it was not necessary to be so close to the cell in order to get an adequate signal-to-noise ratio. It therefore seems unlikely that injury and leaking K^+ can explain the observed thermosensitivity, since we obtained reproducible results on one or more cycles of temperature change. Although injury certainly can contribute to resting discharge rate, it is difficult to suppose that the injury-induced discharge would increase on warming in one cell and decrease on warming in the next.

We hope that our results stimulate others to investigate the inherent thermosensitivity of neurons in this and other areas of the nervous system which are not involved in temperature regulation, perhaps using techniques different from those which we have used.

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Taste Distortion and Plant Palatability

In their recent review of chemical interaction of organisms, Whittaker and Feeny (*1*) duly emphasize the importance of the so-called "secondary substances" of plants, which mediate many of the relationships between these organisms and their mutualists and antagonists. Particularly widespread among secondary substances are the palatability factors, of which some act as defensive subtances by causing distastefulness of leaves or other vegetative parts and others act as enticing agents by promoting the edibility of fruit. Convention tells us that these substances exert their effect because of their intrinsic taste, and in most cases this is undoubtedly true. However, we would like to point to the existence of another category of palatability agents, which we propose to call "taste distorting factors," that act by modifying the perceived taste of substances that accompany them. Two of these factors are well known, and have been the subject of considerable recent behavioral and neurophysiological study. Their possible adaptive significance appears to have remained unrecognized.

One factor, gymnemic acid (*2*), present in the leaves of a tropical asclepiad (*Gymnema sylvestre*), depresses the perceived sweetness of sugars. The effect is remarkable on man [an orange eaten after one has chewed *Gymnema* leaves tastes like a lemon or lime (*3*)], and has been demonstrated, both behaviorally (*4*) and neurophysiologically (*5–7*), to occur also in other mammals. We suggest that *Gymnema* is protected by this effect, since in the absence of detectable sweetness a browser may choose not to persist in feeding on the plant.

The other factor accomplishes the converse. It is called miraculin, and is a glycoprotein (*8, 9*) present in the berries of an African shrub (*Synsepalum dulcificum*). Miraculin causes acidic substances that ordinarily would taste sour to seem sweet. The effect on man is again striking: to one who has just chewed a *Synsepalum* berry, a lemon tastes like an orange (*9*). For a plant that depends upon fruit eaters for seed dispersal (*10*) it is obviously adaptive to provide sweet-tasting fruit. This, we believe, is what miraculin accomplishes, albeit in an indirect way. It permits maintenance of acidic (*11*) and hence potentially antimicrobially protected fruit, while at the same time causing the acid to be falsely perceived as desirable sugar by the fruit eater.

Taste distortion need not be a highly exceptional phenomenon. Existing evidence already points to other plants (*6*) as carriers of potentially interesting factors. Indeed, taste need not be the only sensory modality subject to distortion by secondary substances from plants. Might not the naturally occuring hallucinogens and psychotomimetic agents (*12*) be evolutionarily justified in terms of maladaptive effects that they could have on herbivores?

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10. The ripe berry of *Synsepalum* is red (*7*), highly palatable (*9*), and is most probably dispersed by fruit-eating birds or mammals (or both).
11. The pulp of the ripe *Synsepalum* fruit has a *p*H of 3.6 to 3.8 (Robert J. Harvey, Meditron, Inc., Wayland, Mass., personal communication).
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