sue that divides us is not whether stimulation per se, as opposed to stimulation experience in the presence of appropriate goal objects, is the critical factor in determining the behavioral effects of lateral hypothalamic stimulation. Stimulation experience with a second goal object is necessary for the emergence of the second behavior in the procedure of Valenstein *et al.*, and also for the threshold changes in my experiment; I have found no effect of stimulation on eating or drinking thresholds unless the stimulation occurred in the presence of relevant goal objects.

The issue that does divide us is whether the stimulation experience results in achange in the drive specificity of the hypothalamic neural elements affected by the stimulation. Valenstein *et al.* assume that the observed behavioral changes imply changes in the motivational state of the animals—that if the animal does not eat on the first trial, but does eat later, a change in drive must have taken place. I do not think we can conclude that an animal is not hungry on the first trial simply because it does not eat. The eating behavior of hungry animals depends on a number of factors in addition to the amount of food deprivation they have undergone. Important changes in feeding behavior occur, with food deprivation held constant, as animals are allowed to get accustomed to novel feeding situations and schedules (*4*). It is worth noting that in electrical stimulation experiments not even the initial (presumably dominant) response is produced on the first trial. Rather, it develops with stimulation experience, just as the second behavior does, and just as normal eating develops with familiarity with the feeding situation.

I suspect that the important effect of stimulation experience is that it gives the animal an opportunity to learn, by trial and error, just what acts and what goal objects are appropriate to the drive state (or states) elicited by the stimulation. I think that such learning must precede stable stimulation-bound responding to every new goal object used in this type of experiment, just as it must precede stable responding to new goal objects under normal drive states. We learn that an object is "food" by tasting it and trying a little; we learn that a right turn at the corner leads to a restaurant also by trying it. Hunger prompts us to act; experience tells us what acts are appropriate. The fact that we are finicky with novel foods, or that we wander rather than go straight to a restaurant, does not necessarily mean that we are not hungry.

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Spin-Orbit Resonance of the Inner Planets

Radar measurements of the axial rotation of Mercury and Venus indicate that the spin and orbital motions of the inner planets are in resonance. Mercury's sidereal spin angular velocity is apparently 3/2 of its mean orbital motion about the sun (*1*). The spin angular velocity of Venus is retrograde and apparently synchronized with successive close approaches with the earth (*2*).

Shapiro observes that, "The length of the day on Venus is therefore about 117 days, apparently by coincidence almost exactly two-thirds of the length of the day on Mercury." I suggest that this commensurability may not be a coincidence, but may be associated with the mechanism responsible for locking Venus's spin period into resonance with the earth's orbit.

The necessary condition for capture into a spin resonance is the presence of an appropriate term in the tidal torque which will damp oscillations about the resonance state (*3–5*). This term is present in the case of Mercury, and the 3/2 resonance is fairly well understood (*3, 5*). In the case of Venus, however, the appropriate damping term is absent (*4, 5*). There is no obvious reason why the spin of Venus should be synchronized with the earth's orbit rather than with its own orbit about the sun, as in the case of Mercury.

Venus makes four axial rotations as seen from the earth in one synodic period (*6*) of 583.9 days. The synodic spin period of Venus, 146.0 days, is something of a magic number among the inner planets. This period is almost exactly 2/5 of the earth's orbital period and is very close to $1\frac{2}{3}$ of Mercury's orbital period. The synodic period of Mercury as seen from Venus is 144.5 days. This suggests that Mercury's orbital motion is nearly commensurate with the earth-Venus spin resonance. If we assume that at some time in the past a triple conjunction of the earth, Venus, and Mercury occurred, one finds that Mercury is again very close to the earth-Venus-sun line after 583.9 days when the Venus spin resonance occurs.

The relation of Mercury's orbit to the earth-Venus spin resonance could provide the necessary mechanism for trapping Venus's spin into this commensurability. Although Mercury's mass is only 1/20 that of the earth, the small additional torques could have a cumulative effect when applied at the proper frequency.

The proof of this hypothesis would require a fairly difficult calculation of the capture probability along the lines set forth by Goldreich and Peale (*5*), including the additional tidal torques of Mercury. It might then be possible to show that this particular resonance occurred because of the combined tidal action of Mercury and the earth on Venus at a time when the three orbits were properly synchronized.

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6. Sidereal periods are measured with respect to the fixed stars, whereas synodic periods are measured from a rotating reference system, usually the earth.

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