does seem clear, however, is that alpha feedback training can lead to large and significant changes in alpha densities when conditions have lowered alpha density below the levels seen spontaneously under optimal conditions. Subjects can acquire volitional control over alpha activity only under conditions which normally lead to decreased densities. Thus, during the initial orientation in the dark, when subjects experiment, but are not especially set to increase alpha density, they achieve a level approximating the level reached with additional training. In the light condition, however, there are marked volitional increases. In spite of these increases, however, in the three procedures reported here, as well as during a number of other procedures run in our laboratory, we have not seen alpha densities beyond an individual's initially demonstrated normal physiological range.

While ambient light is sufficient in the present studies to act as a suppressing stimulus, it is likely that other stimuli such as anxiety or physical stress may, in some circumstances, also lead to suppression which persists. Although no increases in alpha density are seen when the situation presents few suppressing stimuli, alpha feedback training may enable a subject to overcome suppressing effects when they are present. The subjective experiences reported to be associated with alpha feedback training (*3*, *4*) may be understood as a consequence of acquiring skill in disregarding stimuli in the external and, perhaps, internal environment which would ordinarily inhibit alpha activity. Increased alpha densities, then, may best be viewed not as an end in themselves, but as one convenient index of a subject's ability to acquire this skill.

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Strychnine and Memory Process

Alpern and Crabbe (*1*) reported that strychnine facilitates the long-term store of memory and that their data could not be explained by the consolidation hypothesis. I believe their data can also be explained by the fact that strychnine facilitates the consolidation of short-term memory even if injection was administered 24 hours after the last training.

On the basis of the total error scores, during daily retention tests of mice prior to criterion (at least 4 consecutive days), Alpern and Crabbe found that mice exposed to a maze for 2 days and given low doses of strychnine for 10 consecutive days [the experimental group or LD (1-10)] showed significantly improved learning in the retention test when trained again, as compared to the control group, which received the vehicle alone for 10 days between training and retraining. Alpern and Crabbe say that the consolidation argument is vitiated because two additional control groups, given the strychnine injection once either at day 1 [group LD (1)] or at day 5 [group LD (5)] after the last day of initial training showed no statistical differences from the control group. The daily scores on the "number of initial errors" of the above four groups (as estimated from figure 1 of Alpern and Crabbe) could lead to a different conclusion. The performance on retention test day 1 was facilitated as compared to the last day of initial training in two groups; that is, LD (1-10) with 0.7 less error (from 2.5 to 1.8) and LD (1) with 0.5 less errors (from 2.75 to 2.25). Mice in these two groups had received strychnine 24 hours after their last day of initial training. In contrast, a performance decrement was found in two other groups in which mice received no strychnine for at least 5 days after the last day of initial training: the control group with 0.5 more errors (from 2.5 to 3.0) and LD (5) with 0.6 more errors (from 2.1 to 2.7). According to the savings scores above, the administration of strychnine 24 hours after the last training day facilitated the consolidation process even though retrograde facilitation for only a few hours after final training has been reported (*2*).

Alpern and Crabbe have excluded the possibility that strychnine enhanced short-term memory consolidation, because group LD (1), which also received strychnine 24 hours after the last training, was not statistically different from the control group. This inference was based on total error scores before criterion was reached (at least 4 retention days) rather than savings scores between days. In addition, I have been told by Alpern that there were no significant differences between the scores of day 1 of retention tests even in the case of group LD (1-10) and the control group. Even with the pooled scores, the facilitation effect in LD (1-10) is very small. Any facilitation in group LD (1) may be lost because of its overall small magnitude. In any case, the reasons for strychnine facilitation of performance only in group LD (1-10) remains to be examined. I suggest that the consecutive injection schedule may, through an unknown mechanism, prolong the labile phase of (short-term) memory into a period longer than 24 hours, so that a cumulative effect on memory store can be seen.

Additional control groups—such as LD (2-10), with the vehicle injection at day 1 after the initial training and strychnine injection at low dose daily for 9 days, LD (1-5) and LD (6-10)—would provide information on whether consolidation could be manipulated with strychnine for a period of up to 10 days. Without these controls, the consolidation hypothesis cannot be rejected.

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Hu suggests that our data support a consolidation interpretation on the strength of two arguments: (i) on inspection of our figure 1 (*1*), that the only two groups which showed "savings" (these are, in fact, not savings scores but mean-error differences) on the first day of retention testing [groups LD(1-10) and LD(1)] received strychnine 24 hours after initial training; and (ii) that any facilitation in group LD(1) is masked by training to a criterion of learning. Let us consider these points.

Since retrograde facilitation of memory consolidation has been reported after a single injection of strychnine sulfate (*2*), it seems likely that a significant facilitation should have been detected on day 1 of retention testing if consolidation were affected. However, as Hu points out, differences among the groups on day 1 of retention testing were not significant (initial errors: $F = 2.14$, d.f. = 5,100, and $.5 < P < .10$; total errors: $F = 1.90$, d.f. = 5,100, and $P > .10$). Consequently, we are reluctant to draw conclusions on the basis of such nonsignificant effects. In a recent analysis of this phenomenon, we looked at the effects of several analeptic and stimulant drugs on the long-term memory store and used a similar paradigm (*3*). We examined retention on day 1 and on learning to a criterion in that study, and we found no consistent relation between the strength of drug effects on day 1 and criterion. For strychnine sulfate, the facilitating effect was of approximately equal magnitude in both measures. If the observed facilitation in this paradigm were due to consolidation enhancement, one would expect the strongest effect on day 1.

McGaugh and Krivanek (*4*) administered strychnine sulfate (either 0.1 mg/kg or 1.0 mg/kg) to mice at several intervals before and after daily maze training. The higher dosage of strychnine was effective at a longer pretrial interval than the lower dosage. Although they did not obtain a parallel dosage-time relationship for administration posttrial it would have been manifested between 1 and 2 hours posttrial, but they did not examine this interval. A similar dosage-time relationship has also been demonstrated for posttrial administration of *d*-amphetamine sulfate (*5*)—that is, a higher dosage produced effects at a longer interval than the lower dosage. Since 24 hours is long beyond the effective interval reported for strychnine, we would expect that the higher dosage we used (1.0 mg/kg) would have had at least equal efficacy to the lower dosage (0.2 mg/kg) at this extreme interval. However, neither groups HD(1) nor HD-(1-10) showed savings.

A consolidation interpretation is unlikely for a number of other reasons. In the only direct measures of short-term memory (STM) in mice, Alpern and Marriott have demonstrated that the gradient of STM in the C57BL/6 strain is less than 20 minutes, and no longer than 20 minutes in any of the other strains examined (*6*). Even allowing for differences in task, the discrepancy between 20 minutes and 24 hours is most impressive. More up-to-date reviews of the consolidation literature than the one cited by Hu have not reported facilitation of memory by strychnine or other neural excitants administered more than a few hours after training (*7*). Hu suggests that the consecutive injection schedule used in our study may have extended in some unknown way the STM gradient to 24 hours. In most consolidation studies, however, consecutive training-injection sessions, almost always separated by 24 hours, were used (*7*). If the supposed extension of the STM gradient is due only to the repetition of injections, then the time dependency reported for strychnine's effect on memory should never have been obtained. In other words, regardless of the interval posttrial, the simple repetition of drug administration each 24 hours should have always produced facilitation by extending the gradient of susceptibility through Hu's unknown mechanism. Examination of the investigations cited above do not support this notion.

For these reasons, we believe that our data are best explained as supporting an hypothesis of facilitation of the long-term store of memory.

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Radar Mapping of the Moon: Central Peaks

Topographic mapping of the lunar surface through radar interferometry can provide critical information for interpreting lunar processes. However, a discrepancy in elevations determined by radar and photographic techniques raises questions concerning the precision of present radar-derived lunar altitudes. From radar mapping of the Alphonsus-Ptolemaeus-Arzachel region, Zisk (*1*) indicated that whereas the floor elevations of Alphonsus and Arzachel differ by 600 m the central peaks of the craters are at the same altitude. This led Zisk to suggest that the peaks are volcanic edifices contemporaneously fed from a common magma chamber. Radar measurements gave the heights of the central peaks of Alphonsus and Arzachel as 600 and 1200 m above their respective floors, with a probable error of better than 200 m. However, from measurements of the lengths of the shadows cast on Orbiter IV (*2*) and Ranger IX (*3*) photographs, Alphonsus' peak is 1100 m high and Arzachel's is 1900 m high, with a probable error of 50 to 100 m. The highly accurate topographic map of Alphonsus prepared by Wu *et al.* (*4*) from photogrammetry of Apollo 16 metric camera pictures confirms this peak height for Alphonsus, and measurements of shadows on photographs taken from the earth corroborate the Orbiter height for Arzachel's peak (*5*). Experience indicates that heights derived from shadow measurements are not affected by systematic errors large enough to explain the inconsistency with the radar results. Thus, topographic data do not support the contention that the peaks are volcanoes.

There is an additional source of uncertainty regarding the radar topographic map [figure 2C in (*1*)]; the central peak of Alphonsus does not appear in