minutes of the REM state, combined with the irregular time of appearance of cardiovascular irregularities (*11*), make this explanation unlikely.

The volume and osmolality changes were more likely concomitants of central nervous system changes associated with the REM state. The evidence is (*12*) that the REM state may be a special kind of "arousal," with many of its central and peripheral manifestations resembling more an awake than a sleeping state. We have recently reviewed several studies indicating that various kinds of emotional-arousal states in man are associated with decreases in urine volume (*13*), probably secondary to release of antidiuretic hormone. Our results demonstrate that short periods of lying awake in the middle of the night (not the early diuretic phenomena associated with lying down and going to sleep) were associated with the same biphasic response of urine volume and osmolality that is seen in the REM state (Fig. 2). Brainstem and limbic "activation' associated with the REM state (*1*) may have been transmitted to the hypothalamic nuclei, concerned with control of antidiuretic hormone, by way of established pathways (*2*).

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# Parturient Mice: Effect of Environment on Labor

Abstract. *More first-born pups and greater numbers of pups were born in a familiar cage having a covered nesting box than in a glass bowl, when pregnant mice at term were alternated between contrasting environments. Current theories emphasize the influence on labor of mechanical and hormonal factors; these data suggest that environmental factors also may play a role.*

Current physiologic theories and medical and veterinary therapeutic practices concentrate almost exclusively on the endocrine and mechanical factors involved in the onset and progress of labor (*1*). Ecologic and clinical observations (*2*) suggest, however, that environmental factors also may influence labor to some extent.

This experiment was designed to test the hypothesis that environmental factors play a role in labor. White mice of the CF1 strain were used because previous work had shown them to be placid (*3*) and otherwise suited to the design of the experiment. Dated pregnancies were produced by adding male mice to a colony of nulliparous female mice for approximately 13 hours from 8 p.m. to 9 a.m.; the lighting was normal. Eighteen days later, females judged to be probably pregnant were placed individually in cages with opaque sides and nesting boxes—replicas of the cages that had housed the mice before removal from the colony. Each cage contained a wooden nesting box (22.5 by 15 by 9.4 cm) having a hole in the side to permit entry of the mouse and containing soft rayon bedding; a wooden top, completely covering the box and sheltering the mouse from view, was removable to permit complete inspection of the box during the experiment.

The preference of nulliparous pregnant mice at term for the covered nesting box is statistically indicated by the fact that they were found inside the box in 47 of 60 observations of 21 individuals at 2- and 4-hour intervals. There is no record of the sites of delivery; observation was not continuous, but delivery regularly seemed to occur within the covered nesting box.

All pregnant mice were left overnight in their individual cages containing nesting boxes. Next day, between 1 and 2 p.m., all cages were moved to a large observation room, and another type of cage that was to serve as an unfamiliar, unsheltered environment was placed beside each cage.

This second type of cage consisted of a standard glass fish bowl about 17.5 cm high; the bottom contained two cups of coarse gravel, with a quarter cup of uriniferous bedding from cat cages to imbue the bowl with a strange odor. Wire mesh atop the bowl retained the mouse. Both types of cage contained food pellets. Since water is difficult to administer in a glass bowl, both experimental environments contained only apples instead of water for moisture; apples had proved sufficient to maintain a parturient mouse of this strain during both labor and the first week of lactation.

Mice were randomly divided into

Table 1. Birth sequence distribution: numbers of pups born in the two environments. F, Familiar cage with covered nesting box; U, unfamiliar glass bowl.

| Mothers moved every 2 hours (2-hour intervals) | | | | | Mothers moved hourly (1-hour intervals) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | U | F | U | F | F | U | F | U | F | U | F | U |
| 2 | | 4 | | | 1 | | | | 2 | | 5 | 3* |
| 2 | | 1 | 4 | | 4 | | | | | | | |
| 1 | 6 | | | 1 | 3 | 4 | | | | | | |
| 1 | | 6 | 4 | | 3 | 1 | 1 | 1 | 1 | | | |
| 10 | | | | | 1 | 8 | 1 | | | | | |
| 1 | 1 | 6 | | | 1 | | 6 | 5 | | | | |
| 7 | 5 | | | | 7 | | | | | | | |
| 6 | 3 | | | | 1 | 2 | 2 | | | | | |
| 1 | 6 | 5 | | | 3 | 3 | | | | | | |
| 5 | 8 | | | | | 3 | 3 | | 8 | | | |
| | 3 | 8 | | | | 1 | 4 | 9 | | | | |
| | 1 | 5 | 1 | | | 1 | 9 | | | | | |
| | | | | | | 4 | | | | | | |

* Killed at end of experiment, 26 hours after these births; two pups found at autopsy.

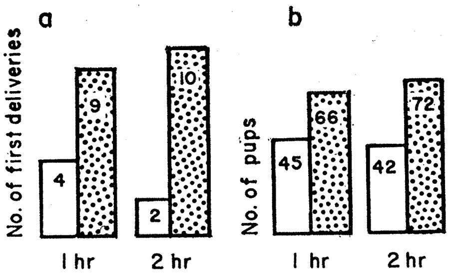

Fig. 1. (*a*) Number of firstborn in relation to type of environment. (*b*) Total number of pups delivered in relation to type of environment. White bars indicate use of unfamiliar glass bowl. Dotted bars represent familiar cage with covered nesting box. Environment was changed every hour and every 2 hours.

four groups. Groups A and B were moved from one environment to the other every hour; groups C and D, every 2 hours. The experiment started at 2 p.m. when groups B and C were removed from their familiar environment to the glass bowl; groups A and D were merely inspected to see if pups had been born before the experiment began. The experimental period continued for 52 hours, during which time half of the adult mice were in the bowl environment and half in the nesting-box environment. Immediately after removal of mice from one type of cage to another, the contents of the vacated cage were inspected; pups were removed and their number recorded. After the experiment the adult mice were killed and autopsied.

Of the 32 mice judged probably pregnant and removed from the nulliparous colony, two mice delivered before 2 p.m. while caged individually in the nesting-box cage and were eliminated. Of the 30 mice that started the experiment, five had no recorded deliveries; two of the five contained two pups each at autopsy, two contained no pups, and one died during the experiment while carrying eight pups. Despite this death, immediate mortality of pups was not high: only 4 out of 87 pups from bowls and 7 of 138 pups from nesting-box cages were judged dead upon removal.

Only the 25 mice whose deliveries were recorded during the experiment were included in the statistical calculations and Table 1; 24 of them had no pups at autopsy, and one still carried two after delivering 11 during the experiment.

In the experiment as a whole, more first-born pups and more total pups were found in the familiar environment with covered nesting box than in the glass bowl environment. Nineteen first pups were delivered in the cage with nesting box, compared with six in the bowl. The probability of these numbers resulting from chance alone is less than .01 ($\chi^2$, 6.76; df, 1). One hundred and thirty-eight pups were born in the familiar nesting-box cage compared with 87 in the glass bowl; by the Wilcoxon matched-pairs signed-ranks test, the probability of this occurring by chance alone is .05 (*4*).

When one breaks down the data into 1- and 2-hour rotation groups, the same trends appear in both parts of Fig. 1; more total pups and more first pups were recorded for the familiar environment with covered nesting box. The differences in these small groups reach statistical significance only for the number of pups dropped in each environment by the mice that were moved every 2 hours, for which the Wilcoxon matched-pairs signed-ranks test shows a probability of .01.

Birth sequence distributions for individual mice (Table 1) show that the birth of pups in some instances was spread over several hours. And in 5 out of 25 instances there appeared to be temporary cessation of effective labor (labor inertia), because 2 hours or more elapsed before additional pups were observed. Such prolonged labors and labor inertias seem atypical for the mouse.

The difference that we report in number of first pups born in each environment covers an earlier part of labor than was previously investigated by us; it suggests that environmental influence may operate before the birth of the first pup. The finding that the total number of pups born differs with the type of environment tends to reinforce our previous finding that labor was 64.7- to 72.1-percent slower between the births of pups 2 and 3 when environmental disturbance was applied (*3*). Viewed together, these findings suggest that environmental factors play an appreciable role in influencing the course of labor.

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## Russian Luna IX Pictures: Provisional Analysis

The several pictures transmitted by Luna IX and made available through the wire services show a small area (found below to be roughly 100 $m^2$), near the western shore of Oceanus Procellarum, according to the releases by Tass, located some 70 km northeast of the center of the crater Cavalerius (*1*). From the approximate coordinates alone it is not certain whether the area is situated in the mare itself or on one of the small offshore islands.

The vertical scan axis of the panoramic camera was apparently tilted about 23°, causing the quasi-horizontal panoramic view to cut the horizon twice, 180° apart, and to dip a maximum of 23° below the horizon halfway between. The direction of maximum dip (that is, of greatest proximity of foreground to camera) was nearly directly below the position of the sun, as inferred from the shadows, and was therefore eastward of the space craft. At least three (partial) scans appear to have been obtained, with the sun elevation increasing from about 7½° to 27°. The camera position appears