of rillensteine formed by solutional etching. At a few points the rillensteine, in turn, show some smoothing by renewed sandblasting.

Between kilometer posts 235 and 250, and also at other places, irregular sheets of older eolian sand mantle many of the hill slopes, filling minor stream channels. The sand surface is dark in color and is well stabilized by a litter of rock chips and granules, suggesting immobility for a long interval of time. At several places, however, the older sand is being overridden by drifts of light-colored, fresh eolian sand, which stand in sharp contrast, and indicate renewal of eolian activity.

Although these observations were made in widely separated locations, they are consistent with one another and suggest the following climatic chronology: (i) an earlier episode of vigorous sand movement and sandblasting by wind, under climatic conditions more or less similar to those of the present, though perhaps windier and/or drier; (ii) an interval of decreased wind action, perhaps caused by greater humidity, that permitted stabilization of sand surfaces and modification of wind-fluted surfaces on soluble rock by solution and disintegration; and (iii) a recent shift to increased wind action, which was caused by reduced moisture and/or stronger winds. No evidence concerning the date of the earlier two episodes of contrasted eolian activity was found, but it is surmised that they date back not more than a few thousand years, perhaps much less. The current episode of renewed eolian activity is tentatively correlated with climatic conditions responsible for the recent marked recession of mountain glaciers, as reported by Broggi [in F. E. Matthes, *Trans. Am. Geophys. Union* **27**, 219 (1946)].

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26 May 1955

Prenatal Oxygen Deprivation and Subsequent Specific Behavior Dysfunctions

Recent experimentation (*1*) has indicated that unique anomalies follow physiological insults at specific points in the organism's development. Should the insults (irradiation, nutritional and oxygen deprivation, trauma, and so forth) occur at times when certain systems or tissues are undergoing the greatest differentiation and proliferation, these systems or tissues will show the most severe alteration in structure and function. If this is the case, two methodological uses may be suggested: (i) by properly timing the onset of the insult, information concerning the sequence of developmental events may be obtained; (ii) insults at prescribed periods may aid in describing the structure-function relationship that is inferred from the variations in the behavior of the organism.

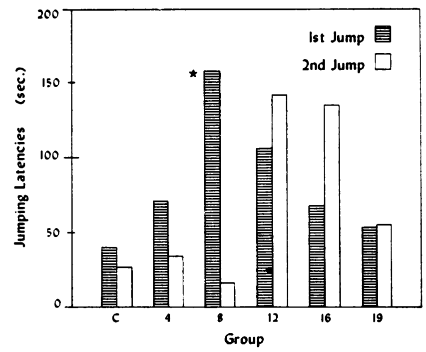

Fig. 1. The performances of the control and experimental groups on the first and second jumping tests. Plotted data are median scores. (The asterisk indicates that the difference between the experimental and control groups is significant beyond the 0.05 level.)

Our study (*2*) applies to this second approach for the purpose of clarifying the function of ablations when incurred in the young organism (chicks), that is, when the opportunities for experience are controlled. We propose that oxygen deprivation at the time of the greatest structural development of the visual-motor system [about 8 days, as indicated by the growth of the optic lobes and related structures (*3*)] would evince dysfunctions in visually dominant behavior.

Five incubation stages were used: 4, 8, 12, 16, and 19 days. Representing these conditions were 12, 17, 6, 12, and 15 chicks, respectively. Eighteen chicks served as controls. Subjects in the experimental groups were deprived of oxygen for the median lethal dose (LD_{50}) by immersion in distilled water at incubation temperature (99.5°F). The LD_{50} was a predetermined period of immersion ranging from 105 min for the 4-day group to 25 min for the 19-day group.

After the chicks hatched, the following measures were made: (i) weight (2nd day); (ii) sensitivity of the optokinetic reflex (7th day); and (iii) jumping performance (two measurements: 4th, 5th, or 6th day, and 11th, 12th, or 13th day, respectively).

An apparatus similar to the one designed by K. U. Smith (*4*) was used for measuring the optokinetic reflex. The drum, 22 in. in diameter, rotated at 4.3 rev/min. The vertical stripes were 2 in. wide. The index of reflex sensitivity was the time for 40 flexures of the head in response to the moving stripes.

A technique reported by Fletcher *et al.* (*5*) was used of measuring the chick's jumping behavior. The animal jumped from a platform 4 in. in diameter from heights starting at 15 in. and rising by 5-in. increments to 60 in. For each chick and for each height latency scores and the maximum height (that height for which the latency score was 360 sec or greater) were recorded. On each of the two jumping days, the subject was isolated from food and brood mates for 2 hr. The incentives for jumping were food and two brood mates.

Based on the developmental schedules of the embryo, we predicted that the 8-day incubation group would show: (i) a reliable difference in jumping behavior as indicated by latency scores; and (ii) inferior reflex sensitivity as indicated by greater time indices.

The graphic representations show the distinctiveness of the 8-day group. These subjects were significantly lower (*6*) ($p < .05$) than the controls at the first jumping test (Fig. 1). However, no reliable differences in performance were found at the second jumping test. The greatest difference (insignificant statistically) was between the control group and the 12-day groups.

On the optokinetic apparatus, only the 8-day groups could be statistically distinguished from the control group ($p < .01$; Fig. 2). No differences in weight were found between the control and experimental groups, nor were obvious anatomical or locomotor defects noted. Incomplete data on other tasks, such as the Fink Arrow Maze (*7*), suggest that the uniqueness of the 8-day group noted in this experiment need not apply to other behavior.

In conclusion, these performance data substantiate the predictions: Variations in visual-motor behavior were reliably affected when oxygen deprivation was incurred at the 8th day of incubation, the period of greatest development of the visual-motor system. Insignificant, but

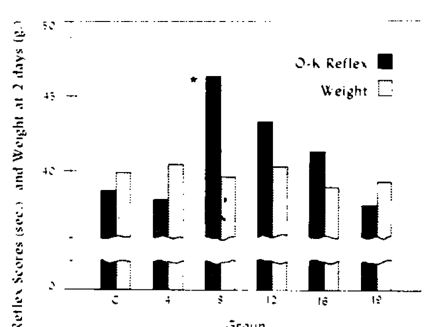

Fig. 2. Time scores on the opto-kinetic apparatus and weight measures on the 2nd day. Plotted data are median scores. (The asterisk indicates that the difference between the experimental and control groups is significant beyond the 0.01 level.)

consistent, differences were found with other experimental groups, possibly indicating the effects of the deprivation on other systems that are not so important in the behavioral tasks used here. A comparison of the performance of the 8- and 12-day groups on the first and second jump suggests the operation of differential effects of early experience.

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References and Notes

1. T. H. Ingalls, in *The Biology of Mental Health and Disease* (Hoeber, New York, 1952), pp. 389–401; B. Levinson, *J. Comp. Physiol. Psychol.* 45, 140 (1952).
2. This investigation was supported in part by research grant M-762 from the Institute of Mental Health, National Institutes of Health, U.S. Public Health Service.
3. H. L. Hamilton, *Lillie's Development of the Chick* (Holt, New York, 1952).
4. K. U. Smith, *J. Genet. Psychol.* 50, 137 (1937).
5. J. M. Fletcher, E. A. Cowan, A. H. Arlitt, *J. Anim. Behav.* 6, 103 (1916).
6. As the distributions of these data were not normal, nonparametric statistics were used throughout. The procedures used were those outlined in H. M. Walker and J. Lev, *Statistical Inference* (Holt, New York, 1953).
7. H. L. Fink, *Mind and Performance* (Vantage Press, New York, 1954).

6 June 1955

Synthalin A as Selective Mitotic Poison Acting on α-Cells of the Islets of Langerhans

In recent years it has been discovered that the alpha-cells of the islets of Langerhans, which are considered to be the producers of glucagon (HGF), are seriously affected by synthalin A in adult rats, guinea pigs, and rabbits. Observations on the rabbit have revealed that these cells are at times totally destroyed and that they disappear. Sometimes they are partially destroyed or injured (*1–3*). This phenomenon is accompanied by a sharp decrease in the blood sugar level. The beta-cells and the exocrine part of the pancreas do not demonstrate any pathological changes.

The action of synthalin A on the alpha-cells of young animals has not been previously studied. Therefore we tested 20 young albino rats (ages ranged from the first to the fifth day of life) by giving each a single subcutaneous injection of decamethylenediguanidinedichlorehydrate in aqueous solution at 10 mg/kg of body weight (*4*). The animals, including the controls, were sacrificed 12 to 18 hr after injection by decapitation. The abdominal viscera were fixed in Bouin's fluid. Thin paraffin sections were stained by Gomori's chromehematoxylin and phloxin method.

The pancreas of normal 1-day-old rats contains well-defined and relatively large islets of Langerhans. They show the "Mantelinsel"-type, since it is characteristic of the Muridae. The core of beta-cells is surrounded by an incomplete layer of alpha-cells, the covering layer of which often varies in thickness. The beta-cells, especially the granules, in the young and the adult rat are cytologically similar. The granules of the alpha-cells in young animals are coarser and fewer in number in comparison with those in the adult. It was observed that, between the first and fifth days of life, the number of alpha-cells was absolutely and relatively increased through intensive mitotic division. The increase of the beta-cells was substantially smaller. There were many alpha-cell mitoses and few divisions of the beta-cells. The alpha-to-beta relationship changed from 1 to 2.06 on the first day of life to 1 to 1.61 on the fifth day of life. The proportion of alpha-to-beta cells in the adult rat is 1 to 4 or 1 to 5.

After a single subcutaneous injection of synthalin A, the 1-day-old rats did not manifest clinical symptoms. In contrast, the 2- to 5-day-old rats, at a period 12 hr later, exhibited increasing lassitude, shivering, and altered respiration. In none of the young rats treated with synthalin A were the alpha-cells altered; none showed signs of lesions. There were no alterations in granulation, and no hydropic changes or detritus of alpha-cells, which are found in adult rats after treatment with synthalin A.

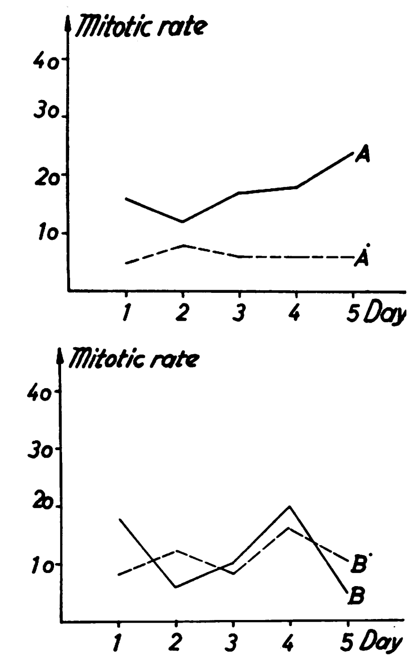

Fig. 1. Above, mitotic rate of alpha-cells in 100 sections through pancreatic islets in rats 1 to 5 days old. (*A*) controls; (A•) effect of synthalin A. Below, mitotic rate of beta-cells in 100 sections through pancreatic islets of rats 1 to 5 days old. (*B*) controls; (B•) effect of synthalin A.

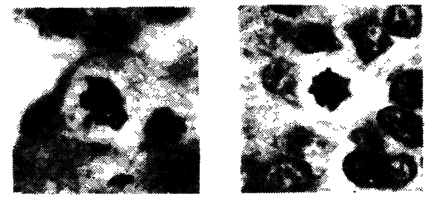

Fig. 2. (Left) Mitotic alpha-cell of 5-day-old rat, control animal, ×700. (Right) Mitotic alpha-cell of 4-day-old rat injected with synthalin A (10 mg/kg), ×700.

In a comparison of the controls and the treated animals, a notable finding concerning alpha-cell mitosis was made—that is, synthalin-treated rats show a significant decrease in mitotic frequency of the alpha-cells, and the remaining mitotic alpha-cells are injured. In contrast, no mitotic divisions of the beta-cells or of the acinar cells of the pancreas were affected either quantitatively or qualitatively. It is interesting to note that the mitotic rate of the acinar cells was much higher than it was in the alpha-cell layer. The rate of beta-cell mitosis in the synthalin-treated rats was nearly the same as it was in the controls. In the treated animals the frequency of the dividing alpha-cells is decreased to 25 percent of the normal on the fifth day of life. The curve of the mitotic activity rose continually from the second to the fifth day of life in the controls. In injected rats the curve remained on a low level (Fig. 1). Microscopic examination of the mitotic figures of the alpha-cells following synthalin treatment revealed a pycnotic degeneration of the late prophase and early-to-middle metaphase (Fig. 2).

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References and Notes

1. J. C. Davis, *J. Pathol. Bacteriol.* 64, 575 (1952).
2. W. Runge, *Klin. Wochschr.* 1954, 748 (1954).
3. C. v. Holt and H. Ferner, *Z. Zellforsch. u. mikroskop. Anat.* 42, 305 (1955); C. v. Holt *et al.*, *Naunyn-Schmiedeberg's Arch. exptl. Pathol. Pharmakol.* 224, 66 (1955).
4. This work has been supported by a grant from the Research Corporation, New York.

13 June 1955

Thermal Shock and Tooth Decay

In an article by D. G. and H. A. Pohl (*1*) they state that one of the possible reasons for the increasing incidence of tooth decay is the alternate eating of very hot and cold foods during the same meal. They submit as evidence an experiment in which extracted teeth are subjected to intense thermal shock and then tested by methods that seem to indicate a de-