of approximately 24 hr and hydroxyphenyl derivatives were determined (*1*).

All ten infants excreted significant amounts of "tyrosyl" before administration of PGA. For one infant, A.L., the gavage feeding of 5 mg of PGA daily for seven

TABLE 2

EFFECT OF INTRAMUSCULAR PGA ON "TYROSOL" EXCRETION

Infant P—weight at birth: 0.97 kg			
Age in days	Weight in kg	Urine "tyrosyl"	
		mg/cc	mg/kg/24 hr
48	2.01	3.4	224
52	2.24	3.2	187
53	PGA—30 mg started daily by gavage		
57	2.27	4.4	227
61	2.35	3.2	273
61	PGA discontinued		
65	2.50	4.8	281
69	2.55	5.1	286
74	2.78	4.1	310
76	PGA—30 mg started daily by intramuscular injection		
78	2.92	0.2	10.0

TABLE 3

LACK OF EFFECT OF PGA ON "TYROSOL" EXCRETION

Infant B. P.—weight at birth: 2.19 kg			
Age in days	Weight in kg	Urine "tyrosyl"	
		mg/cc	mg/kg/24 hr
15	2.13	4.6	240
17	2.27	4.5	337
18	PGA—10 mg started daily by gavage		
20	2.30	3.0	291
23	2.50	4.4	290
27	2.64	4.8	324
31	2.75	5.1	380
32	PGA—20 mg started daily by gavage		
37	2.95	6.1	212
39	3.03	3.9	278
43	3.15	4.6	282
43	PGA—15 mg started daily intramuscularly		
48	3.32	4.4	242
48	PGA discontinued—ascorbic acid 100 mg intramuscularly		
52	3.43	0.4	33

days produced a striking decrease in "tyrosyl" excretion, which persisted as long as 13 days following cessation of PGA therapy. For his twin brother, B.L., gavage administration of 5 mg daily for 10 days was without effect, but 10 mg was effective after four days, (see Table 1). For infant P., the gavage feeding of 30 mg of PGA for eight days was ineffective, but the intramuscular injection of the same dose for two days led to a prompt drop in hydroxyphenyl excretion (see Table 2). For infant R., the administration of folic acid, 10 mg orally for 16 days, had a partial effect, but the administration of 30 mg intramuscularly for three days produced a striking effect. For the remaining six infants, PGA was ineffective whether given orally or by gavage in daily doses of 10–30 mg for periods of 8–15 days, or intramuscularly in daily doses of 15–30 mg for periods of 5–8 days. In five of the six infants for whom PGA was ineffective and who were given ascorbic acid, there was a prompt decrease in excretion of hydroxyphenyl derivatives. The findings for one infant in this group are given in Table 3.

Definition of the conditions under which pteroylglutamic acid is or is not effective in premature infants remains the subject for future studies. It is of interest that a difference dependent on the route of administration was the deciding factor in two of eight infants tested. The variability in response recalls a similar experience with liver extract noted in a previous study (*3*).

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A Method for Self-Control of Population Growth among Mammals Living in the Wild[1]

John B. Calhoun

Rodent Ecology Project, Johns Hopkins University

It is a common observation that the numbers of most organisms in a reproducing population reach an equilibrium with the conditions of their environment. In approaching this upper limit of the logistic of the population, Pearl (*2*) has pointed out that "the rate of reproduction or fertility is negatively correlated with density of population." This is merely a statement of fact which prompts the study of the mode by which the reduction in contribution of progeny to the population occurs. Whatever the means of reduction, the result is that there are less adults to compete for the existing supply of food and harborage.

A recent note in *Science* by Mirone, *et al.* (*1*) suggests one possible way in which the increment to a population may be effectively reduced. They observed in mice that newborn young of mothers on a poor diet frequently fail to survive past the fourth day. From the fact that these same mothers may successfully rear adopted litters born to mothers on an adequate diet, they conclude that failure of the litters to survive is due to inadequate nutrition during gestation. This conclusion suggests that any environmental conditions which affect the maternal

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physiology to the extent that foetal nutrition is lowered will slow down the rate of population growth due to early post-parturition mortality.

Recent observations on the growth of a colony of wild Norway rats (*Rattus norvegicus*) indicates that this process of upsetting maternal physiology may be one of the limiting factors in population growth. This experimental colony is maintained in a 100′-square pen where abundant food (Purina fox checkers) is continually available in a 20′-square central pen to which the rats gain access by four narrow passages. Fig. 1 shows details of the pen.

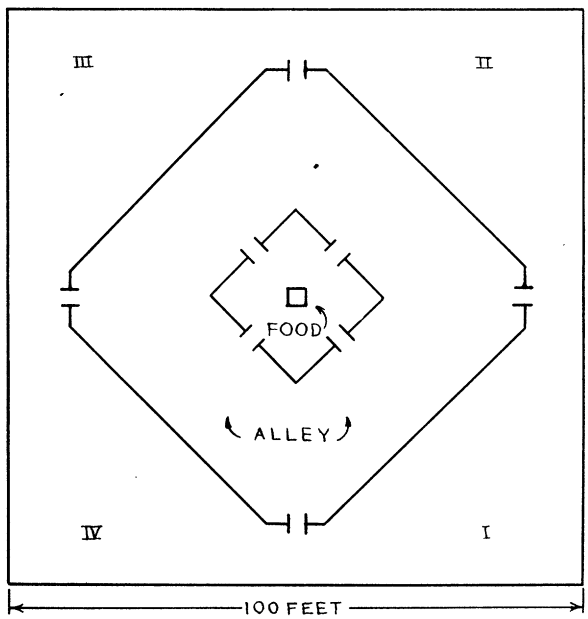

FIG. 1. Diagram of pen in which rats are housed: outer, central, and middle fences which prevent rats from passing over or under them; 8 passages through fences (3″ clay drain tiles); food and water continuously and abundantly available in central pen; 9 harborage boxes in each of the 4 triangular corner areas; rats allowed to dig burrows in alley and in triangular areas.

The colony in the pen was begun with five pairs of rats, which are assumed to have been as genetically homozygous as it is possible to trap them in the wild state. This assumption is made on the following inferential grounds. The rats were trapped in February 1947 on Parsons Island, a 150-acre tract of land in the Chesapeake Bay. Its land bridge with the mainland was severed about 40 years ago, since which time the rats have been effectively isolated. The number of rats on the island has fluctuated widely both on an annual basis and on the basis of changes in agricultural practices. An experimental reduction by poison in 1923 was conducted by the Fish and Wildlife Service. A second experimental reduction was conducted in the spring of 1946 by J. T. Emlen and D. E. Davis, of the Rodent Ecology Project. Estimations of numbers: (a) pre-poisoning, 670; (b) post-poisoning, 220. At the time of trapping in February 1947 surveys indicated that there were probably no more than 150 rats on the island. Under these circumstances of fluctuation in population size, it might be anticipated that considerable homozygosity would have been reached through gene drift (*3*). It is from this inference that the conditions here reported are judged to arise from environmental rather than hereditary differences.

Rats living in the triangular areas were further from the food source than were those living in the alley. There was thus produced a simple gradient of availabilty of food in which one group of rats had an advantage over another group. This gradient of availability of food was intensified by the social life of the rats. Rats become attached to certain areas of the pen and their movements are mainly confined to these areas and from it to the food pen and back. In order to get to the food pen, rats living in the triangular areas frequently must pass near the burrows of rats living in the alley. At such times they may be repulsed by the resident rats. Such repulsion is particularly severe when the resident alley rat is a lactating female. With frequent repulsions the individual's growth rate is slowed down, and since weight is a major factor in winning combats, such individuals occupy a low position in the social hierarchy, and in extreme cases the individual becomes so inhibited that it approaches the food pen with great caution, even when no other rats are about.

TABLE 1

PHYSICAL STATE AND REPRODUCTIVE CONTRIBUTION*
(January 1 to September 25, 1948)

		Average wt. (gms)	Average wounds	No. of pregnancies	Litters weaned
Born in an Area Harborage Box	♀ 17	379^{7}	14^{6}	3	1?
	♀ 20	388^{4}	14^{4}	4†	0
	♀ 25	371^{7}	15^{9}	5†	0
	L - 3 ♀♀	379	14.3	12	1?
Born in Alley Burrow	♀ 33	451^{4}	1^{3}	3	2 (3rd?)
	♀ 37	411^{4}	0.6^{5}	5	4
	♀ 43	426^{5}	3^{4}	4	4
	L - 5 ♀♀	429	1.5	12	10

* Superscripts denote number of observations from which averages were determined.

† Each includes 2 pregnancies for the fall of 1947.

To illustrate the effect of social conditioning on physical well-being and reproduction the histories of three females from each of two litters are given in Table 1. Litter 3 (L-3) was born May 30, 1947, in one of the triangular areas. Litter 5 (L-5) was born August 16, 1947, in the alley near the food pen. Though born 2½ months later the L-5 females average 50 gms heavier than the L-3 females as adults. As individuals, the upper asymptote of their growth curves was reached in 8 months by L-5 females, but not until 12 months by L-3 females, when weight is used as the criterion. The degree

of social inhibition is reflected in the number of fresh wounds recorded at each time of handling. It is the loser in a combat which usually receives wounds as it turns to flee. L-3 females received nearly 10 times as many wounds as L-5 females.

It so happened that the total number of pregnancies for the females in each litter to the last date of handling was the same. The contrast between the two groups in their reproductive history lies in the fate of their litters. Although the socially dominant, larger females were known to have weaned 10 litters from their 12 pregnancies, the socially inhibited individuals with a retarded growth rate definitely weaned no more than one litter. These observations give no direct evidence as to the cause of the differential survival rate of the young of these two groups of females. However, the histories of the mothers indicate that there is a physiological and psychological disturbance in socially inhibited individuals which might have a deleterious effect on the progeny either through poor foetal nutrition or from breakdown of maternal instincts. At any rate, social conditioning may be a potent factor in population control among mammals.

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Chemical Analysis of Spectrophotometric Findings in the Cerebrospinal Fluid

M. Spiegel-Adolf, H. T. Wycis, and E. A. Spiegel

Departments of Colloid Chemistry, Neurosurgery and Experimental Neurology, Temple University School of Medicine, Philadelphia

An attempt to interpret the absorption band shown by cerebrospinal fluids (CSF's) at 2,650 A has to take into consideration a number of substances (*4*): barbiturates, ascorbic acid, purine-pyrimidine compounds and also, to a certain extent, proteins, although the latter give a maximum absorption at a somewhat longer wavelength (2,750 A). While it is easy in most cases to exclude barbiturates by avoiding or stopping their administration several days before the spinal tap, it seems desirable to determine by chemical methods the relative participation of the other components responsible for the absorption at 2,650 A. In 40 CSF's of patients with organic or functional nervous disorders, the ultraviolet absorption and the ascorbic acid content were determined simultaneously, the first by means of a Beckman photoelectric spectrophotometer, the latter by the method of Robinson and Stotz (*2*), as recommended by Satterfield (*3*), and using a Klett-Summerson colorimeter. The data resulting from routine examination of the CSF (total protein, globulin, cell count, Wassermann, colloid gold) were available. In cases in which these data and/or a shift of the ultraviolet peak to 2,750 A indicated an increase of proteins, we determined the protein content also, after the spectrophotometric study; the opalescences caused by sulfosalicylic acid both in a known standard solution and in the CSF were compared by means of the Klett-Summerson colorimeter.

With the help of our standardization graphs, the ascorbic acid values were converted into extinction coefficients and these values (Ea) were subtracted from the experimentally determined extinction coefficients of the CSF (Ecsf) so that a difference (D_1), unaccounted for by the ascorbic acid, resulted. Similarly, the protein values were converted into extinction coefficients (Ep), so that finally a residual value (D_2 = Ecsf-Ea-Ep) was obtained.

The material was arbitrarily divided into three groups, one with low D_1 values (0–0.4), one with intermediate D_1 values (0.41–0.8), and one with high D_1 values (above 0.8). In the first group showing D_1 values below 0.4 and D_2 values up to 0.14, apparently the ascorbic acid and protein content of the CSF accounted for the selective absorption with the peak at 2,650 A. These were cases without definite structural alterations of the central nervous system or with preponderant lesion of the white matter, cases studied one or more years after cerebral injury or in the early stage of cerebral affection.

In group II, showing D_1 values between 0.45 and 0.8 and D_2 values up to 0.61, there were cases of herniated discs, cerebral dysrhythmias, head traumata, an encapsulated metastatic carcinoma of the brain, and a hydrocephalus.

In group III, with D_1 values varying between .84 and 2.3 and D_2 values up to 2.16, ruptured discs, producing spinal block, convulsive disorders, concussion studied shortly after the accident, post-traumatic encephalomalacia, compression of the spinal cord, and particularly tumors of the central nervous system were found. It should be emphasized that this enumeration is only descriptive, and that differential diagnostic conclusions will depend on further studies on a larger material.

These findings indicate that the selective absorption of CSF's cannot be explained in all instances by the ascorbic acid and protein content as claimed by some authors (*1, 7*). In interpreting the residual D_2 values, it seems of interest that they were particularly pronounced in tumors of the central nervous system, i.e., in conditions where a marked destruction of nuclear substances may be expected. It should also be noted that there was a statistically significant difference between the mean E of normal control CSF's and that of CSF's withdrawn between 1 hr and 2 months after cerebral concussion (*6*), and also that D_2 values above the normal range were demonstrable in CSF's tapped shortly after cerebral concussion. These observations are mentioned because this type of cerebral trauma induces chromatolytic changes in the nerve cells (Windle *et al.*, *8*). It therefore seems justified to assume that the residual D_2