gents the ability to cause intracellular sperm proteins to leak into the extracellular medium (*4*). We suggest that various cells and organ systems be screened for sensitivity of their cell membranes to permeability changes caused by chlorpromazine. The demonstration that tissues vary in ability to absorb this drug (*5*) provides a clue to which cell membranes may prove to be sensitive. If differential effects are shown, chlorpromazine may be used in combination therapy to increase accessibility of cell interiors to the second drug, and may be used as a laboratory tool for increasing the range of compounds which can reach the interior of the cell without resorting to complete cell breakage.

That cells can be made "leaky" without impairing their ability to reproduce has recently been shown (*6*). Preliminary data indicate that the site of action of chlorpromazine is a lipid. Cytochemistry and electron micrography will be required for independent confirmation.

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References and Notes

1. Experimental methods followed the general form of those described by M. Sanders and H. A. Nathan, *J. Gen. Microbiol.* **21**, 264, (1959). One simplification of technique substituted a growth medium composed of proteose-peptone (1.0 percent) plus glucose (1.0 percent) for the more expensive defined medium used earlier. It should be noted that organisms taken from cultures of different ages differ in sensitivity to chlorpromazine. Thus to obtain repeatable results it is necessary to fix rigid methods for cultivation of *Tetrahymena* with respect to physiological age of culture and conditions of cultivation such as temperature and amount of aeration.
2. L. Packer, *J. Biol. Chem.* **236**, 214 (1961).
3. We thank L. Packer, University of Texas, Southwestern Medical School, for performing this experiment.
4. T. Mann, *Proc. Study Fertility* No. 6, 41 (1954).
5. M. Berger, *J. Neurochem.* **2**, 30 (1957).
6. H. A. Nathan, *Nature* **192**, 471 (1961).

31 October 1961

Perseveration Factor

In their report, "Cerebral dysfunction and intellectual impairment in old age" [*Science* **134**, 1518 (1961)], Misiak and Loranger present a centroid factor analysis of seven tests showing a clear two-factor structure and then dismiss it with the statement, "The analysis yielded only one significant factor, a general intellectual one in which both critical flicker frequency and age have significant loadings." By the Bargmann-Bartlett test, the probability that one factor is sufficient is .029, while the probability that two are sufficient is .935, so actually both of their centroid factors are significant.

Table 1. Results of an oblique rotation of the centroid factor matrix from the analysis of Misiak and Loranger.

Variables	Factor *A*	Factor *B*
1. Critical flicker frequency	0.56	−0.07
2. Digit Symbol	.30	.48
3. Porteus Maze	.23	.38
4. PMA Reasoning (untimed)	.00	.72
5. Raven Progressive Matrices	.00	.71
6. WCST, perseverative errors, reversed*	.64	.08
7. Age, reversed†	.33	.08

* Freedom from perseverative errors.
† "Youngness."

An oblique rotation of their centroid factor matrix yields the pattern given in Table 1. In making this rotation we first reversed their 6th and 7th variables (WCST, perseverative errors, and age). Then lines ("hyperplanes") were passed through the centroids of variables 4 and 5 and 1 and 6. The factor pattern given in Table 1 shows the projections on the corresponding reference vectors.

Misiak and Loranger state that "it is tempting to draw similarities between conceptual perseveration and the neurophysiological perseveration reflected in flicker-fusion. However, the failure of the factor analysis to uncover a perseverative factor somewhat inhibits such speculation." The conclusion they wanted to draw but didn't is entirely justified by their data. All they needed to do to uncover a perseveration factor was to rotate their centroid matrix, as we have done in Table 1, to approximate simple structure. Factor *A* (Table 1) is a lack-of-perseveration factor, with high loadings on variables 1 and 6; intermediate loadings on 2, 3, and 7; and zero loadings on 4 and 5. Factor *B* is a reasoning factor, with high loadings on variables 4 and 5; intermediate loadings on 2 and 3; and near-zero loadings on 1, 6, and 7.

The cosine of the angle between the reference vectors is −0.50, indicating that the two factors are positively but not highly correlated.

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6 December 1961

There appears to be no single infallible criterion of when a proper number of factors have been extracted. At least 25 different criteria have been proposed. In the present problem we employed Humphrey's rule [B. Fruchter, *Introduction to Factor Analysis* (Van Nostrand, New York, 1954)]. Computationally this is one of the more facile solutions, and correspondingly perhaps one of the cruder ones. The rule of thumb is that if the product of the two highest loadings in a column of the centroid factor does not exceed twice the standard error of a correlation coefficient of zero, the factor is probably not significant. In our problem the product was 1.29 times the standard error.

We are indebted to Cureton and his associates for applying to our data Bargmann's improved matrix formulation of the Bartlett test, a considerably more exact solution than that which we employed. The Bargmann-Bartlett test ordinarily is feasible only with an electronic computer. However, with our small seven-variable matrix, hand computation is quite practicable, as Cureton *et al.* have demonstrated.

Of course the factorial study was a subsidiary analysis. The principal objective was to relate intellectual ability in old age to critical flicker frequency. We were also looking for a perseverative factor, and the analysis by Cureton *et al.* uncovered one which had escaped our analysis. The discovery in the elderly of an apparent neurophysiological perseveration associated with conceptual perseveration is most interesting. However, we do feel that this finding is subject to confirmation with a larger battery of tests of intellectual ability than we employed.

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26 December 1961

Visual System at Fusion

An error in our report entitled "Nonlinear property of the visual system at fusion" [*Science* **134**, 612 (1961)] has been communicated to us by J. Levinson (Bell Telephone Laboratories, Murray Hill, N.J.) and by D. H. Kelly (Itek Laboratories, Lexington, Mass.). Both Levinson and Kelly noted, independently, that the fundamental of the stimuli used in the experiment has sufficient amplitude to account for the obtained results. They point out, correctly, that the conditions of the experiment were such that the amplitude was not only constant but, at the fusion point, of a magnitude that is quite in line with previous results, about 0.5 to 3.5 percent.

The formula for computing this amplitude, as provided by Levinson and Kelly, is

$$m_1 = \frac{2}{\pi}\left[\tan\frac{\pi}{4N_s} - \tan\frac{\pi}{4N_v}\right]\bar{I}$$

where N_s and N_v are the number of pulses in the standard and variable trains, respectively, and $\bar{I}$ is the average luminance. This formula is exact for the case of standard and variable pulse trains of equal duration. Where N_s and N_v are large, the usual small-angle approximation for the tangent may be made.

Our assumption, in writing the paper, was that the amplitude of the fundamental would not be constant over the many conditions of the experiment, during which frequency was held nearly constant. Our checks on this point were in error. No "nonlinear property" of the visual system is revealed. On the contrary, the results provide another confirmation of the low-pass filter-like behavior of the eye above 12 cycles per second or so [H. de Lange, *J. Opt. Soc. Am.* **48**, 777 (1958); D. H. Kelly, *ibid.* **51**, 422 (1961)]. This property of the eye diminishes the effectiveness of the higher harmonic components of complex stimulus wave forms relative to the fundamental [J. Levinson, *Science* **130**, 919 (1959); D. M. Forsyth, *J. Opt. Soc. Am.* **50**, 337 (1960)]. The results also confirm the justice of the plea of Kelly [*J. Opt. Soc. Am.* **51**, 917 (1961)] "that experiments with nonsinusoidal periodic stimuli should be designed on the basis of a preliminary harmonic analysis of the waveforms used."

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7 December 1961

Simple Method of Harvesting Limnoria from Nature

Abstract. Outward diffusion of salt from a concentrated solution placed in a centrally bored, cylindrical hole causes *Limnoria* to collect at the surface of infested wood.

The small marine isopod, *Limnoria*, can digest cellulose and multiply at the expense of this and other substances contained in pilings, dock supports, ships' hulls, floats, barges, or other wooden structures immersed in seawater. The unusual properties of its digestive system, as well as the worldwide, billion-dollar destruction caused by this organism, has led to considerable biological and biochemical research from both basic and applied points of view (*1*). Such research inevitably involves harvesting a supply of specimens from nature, sometimes at frequent intervals and in exceedingly large numbers, depending on the objective of the work.

A convenient solution to the problem of obtaining living, undamaged specimens from the depths of infested wood has been sought in various ways, such as electric shocks, partial putrefaction of the material, and so forth (*1*), but the end result has generally proved either unsatisfactory or unreliable in comparison with the laborious, time-consuming, and painstaking procedure of gradually shaving down the wood with scalpel or razor and gently removing with a pair of forceps whatever individuals chanced to escape laceration or other damage to their brittle exoskeleton and delicate organs.

We have recently found a simple way to cause virtually the entire population of *Limnoria*, comprising hundreds or thousands of individuals in a heavily infested, small block of wood (Fig. 1) to move out of their burrows and adhere at the surface. It is merely necessary to drill a cylindrical hole of suitable diameter down the center of the wood, fill with an oversaturating suspension of sodium chloride in sea water, and cork up the cylinder. The wood is then left immersed in a shallow pan of sea water. In the course of several days, as the salt diffuses slowly from the center, the *Limnoria* move outward. The method is simple, efficient, and possibly applicable to comparable situations involving other types of microfauna (*2*).

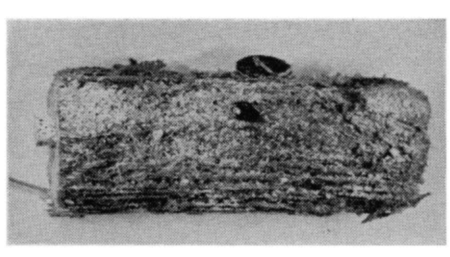

Fig. 1. Active, healthy specimens of *Limnoria* at the surface of a block of wood, 7½ by 3 inches, from a partially destroyed dock. The organisms were driven from their burrows by boring a central hole, ½ inch in diameter, through most of the length of the wood, filling the hole with seawater oversaturated with NaCl, closing with a cork, and leaving the preparation immersed in seawater for several days. [J. Gonor]

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References and Notes

1. D. L. Ray, Ed., *Marine Boring and Fouling Organisms* (University of Washington Press, Seattle, 1959).
2. This research was aided in part by Office of Naval Research Contracts Nonr-1353(00) and Nonr 477(05).
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Plasma-Free Corticosteroid Response to Electric Shock in Rats Stimulated in Infancy

Abstract. Circulating corticosteroids were measured after a brief electric shock in rats which were manipulated during infancy. When compared to nonmanipulated controls it was found that the manipulated rats showed a significant elevation of corticosteroids as early as 15 seconds after shock, whereas the nonmanipulated subjects did not show a significant elevation of steroids until 5 minutes after a brief shock. Further, the levels of corticosteroids were consistently higher in the manipulated subjects over a 15-minute period.

Recent experiments which have been reported concerning the effects of infantile experience in the responses to stress in the adult organism have in general indicated that animals which have been treated in a variety of ways as infants tend to exhibit a less pronounced physiological response to stress in adulthood than their nontreated counterparts.

Thus hypertrophy of the adrenal after chronic exposure to such stressors as an injection of hypertonic glucose (*1*) or daily exposure to fear-producing