On the present evidence, the most parsimonious interpretation is in favor of reserpine's depressing temporarily both performance and learning—that is, that the drugged animals were functionally impervious to conditioning and extinction events, had to "start from scratch" once the drug had worn off, but subsequently responded normally to such events. Insofar as the reserpine groups, when tested after the gross effects of the drug had dissipated, differed from the controls in their rate of conditioning or extinction, they required more conditioning trials and fewer extinction trials, although these differences are far from being statistically significant. If, with a larger N or more refined technique, such differences were to become significant, explanation might follow one of several courses.

Examples of such possible explanations include the following: slight amounts of reserpine (or a metabolic product) might be active in the organism long after its gross effects had disappeared; in extinction, the reserpine animals have a longer time to "forget" the conditioned response, if they are impervious to the extinction events; the "baseline level of anxiety" might remain lower even after the drug has been completely metabolized.

LAWRENCE WEISKRANTZ*
WILLIAM A. WILSON, JR.
Department of Neurophysiology, Institute of Living, Hartford, Connecticut

References and Notes

1. L. Weiskrantz and W. A. Wilson, Jr., *Ann. N.Y. Acad. Sci.* 61, 36 (1955).
2. A. E. Earl and R. C. Dibble, *The Effect of Reserpine (Serpasil) on Monkeys*, a film narration (Ciba, Summit, N.J., 1953); A. J. Plummer *et al.*, *Ann. N.Y. Acad. Sci.* 59, 8 (1954).
3. The shock intensity used was the strongest value in the listed series.
* Present address: University Laboratory of Physiology, Oxford, England.

13 December 1955

New Theory of Interference in Clotting Mechanism by Abnormal Plasma Proteins

The present communication postulates a new type of defect in the clotting mechanism. This consists of the production by the body of globulins that have the ability to combine with and precipitate prothrombin and accessory factors from the blood plasma. The consequence is that the normal clotting mechanism is unbalanced. This results in the following changes: (i) a reduced concentration of clotting factors in the circulating blood, causing hemorrhages, and (ii), localized concentrations of prothrombin and accessory factors, causing thrombi.

Clotting defects, both hemorrhages and thromboses, are known to occur in association with clinical conditions in which abnormalities in the plasma globulins are well recognized, such as macroglobulinemia (*1*), multiple myeloma (*2*), purpura hyperglobulinemia (*3*), and cryofibrinogenemia (*4*). In addition, there exist clinical conditions such as carcinomatosis (pancreatic and so forth) (*5*), thrombophlebitis (*5*), pulmonary infarction, coronary occlusion, abdominal thrombosis, and postoperative thrombosis in which the causes of the thromboses have been the subject of investigation for many years without elucidation of their etiologies. Such cases now require reinvestigation in the light of our present theory.

This theory is based on the demonstration (*6*) that the precipitation of euglobulin, by dilution of plasma, takes out with it prothrombin and factor VII (stable factor). In one case (L. S.), the euglobulin consisted of macroglobulins with a major ultracentrifuge sedimentation component at $S_{20} = 20$ and two minor components at $S_{20} = >20$. In a second case (R. B.), euglobulin and cryoglobulin precipitates were obtained, both of which precipitated out prothrombin and accessory factors (factor VII), the euglobulin to a greater extent than the cryoglobulin. The euglobulin contained no macroglobulins, contrary to expectations. Both cases had increased plasma viscosity, which showed an anomalous rise with decreased temperature. Cryoprecipitability could be elicited in one case (R. B.) by prefreezing the plasma sample and in both cases by reducing the salt concentration of the sample. Macrogobulin precipitated under these conditions (L. S.) can be redissolved by the addition of albumin or minute traces of sodium carbonate but not by gamma globulin.

Both cases had hemorrhagic tendencies and reduced prothrombin activity. Case L. S. also had an extensive thrombus of the iliac vein. Precipitation of the euglobulins from both cases caused a marked reduction of both prothrombin and factor VII in the euglobulin-free plasma. The prothrombin and factor VII could be demonstrated in the solution of the precipitated globulins. The addition to and precipitation of macroglobulin from normal plasma removed prothrombin and factor VII from the normal plasma.

In addition to the afore-mentioned results, we have found that cold precipitable material is obtainable from normal and pathological plasmas. This material contains both fibrinogen and small amounts of prothrombin. Hence, the cold precipitation of fibrinogen takes down with it prothrombin. Studies of cryoglobulins are in progress. It is highly probable that prothrombin combines easily with many globulins in addition to the accessory factors required in the clotting mechanism. The ease with which prothrombin is adsorbed by barium sulfate is well known. Slight changes in the plasma globulins that permit precipitation, therefore, would sequester prothrombin from the circulating plasma.

HENRY H. HENSTELL
MIRIAM FEINSTEIN
Institute for Medical Research, Cedars of Lebanon Hospital, and Department of Medicine, University of Southern California School of Medicine, Los Angeles

References and Notes

1. J. Waldenström, *Acta Med. Scand.* 117, 216 (1944).
2. R. M. Hill, S. G. Dunlop, R. M. Mulligan, *J. Lab. and Clin. Med.* 34, 1057 (1949).
3. J. Waldenström, *Acta Med. Scand.* 142, 931 (1952).
4. D. R. Korst and C. H. Kratochvil, *Blood* 10, 945 (1955).
5. L. Mirabel, *Can. Med. Assoc. J.* 70, 34 (1954).
6. This work was aided by a grant from Leukemia Research, Inc., Los Angeles, Calif. A more detailed report is in preparation.

6 February 1956

Pollen from Leda Clay of Maine

Marine clays of late glacial age occur widely in eastern Maine from below sea level to 400 ft or more above. These clays occasionally contain a well-preserved molluscan fauna of northern affinities, suggesting that, during the time of their deposition, the water was colder than it is at present. Because of the presence of species of *Leda*, these clays are frequently referred to as Leda clays, although their affinity is closer to the later *Saxicava* phase of the marine sediments in southeastern Canada.

One of the most productive fossil localities of the Leda clay in Maine occurs at Goose Cove on Mount Desert Island. The fauna from this locality has been described by Blaney and Loomis (*1*), who note that the assemblage has strong affinities with the present molluscan fauna of Labrador.

I had occasion to examine the clay from this locality for microfossils. The sample from which the analysis was made came from highly fossiliferous beds about 10 ft above high tide near the head of the cove. The microfossils were separated by a bromoform-acetone mixture (*2*) with a specific gravity of 2.3. A large number of pollen grains and spores, together with some marine and brackish-water sponge spicules and a few Foraminifera, were recovered. Table 1 shows the result of the pollen-spore analysis.

The pollen content of the clay is very similar to the pollen assemblages that I found in late glacial clays of southeastern New England, but it differs in several respects from the pollen flora of the interstadial clays and clay tills of the Cape Cod area (*3*).

The exact age of the Leda clay is still unknown. Although there is evidence that glacial ice still existed in the vicinity when the clay was deposited, the fauna is by no means arctic in character. Studies of lake and peat deposits in this region by Deevey (*4*) and me (*5*) indicate that the marine submergence occurred previous to Zone A1 of Deevey's late-glacial pollen chronology.

According to this chronology, widespread tundra conditions prevailed in southeastern Maine and possibly as far south as Connecticut in late glacial time. However, my pollen studies of late glacial clays from eastern New England do not indicate that such conditions existed during the time of deposition. Pollen grains from plants that are common in a tundra or semitundra environment are lacking or are very rare. Furthermore, the total nontree pollen, including spores, is very low compared with the total tree pollen, a condition just opposite to that which occurs in tundra areas. The great number of tree pollens, especially those having a relatively high rate of fall, precludes the possibility of their having been transported by wind any great distance.

The possibility that the pollen grains in the clay from Goose Cove are secondary seems unlikely for several reasons. (i) There are no known interglacial or older deposits in Maine from which the pollen grains could have come. (ii) The unusual abundance of the pollens at Goose Cove and the lack of other plant remains indicate that the plant microfossils have not come from reworked pollen-bearing deposits in the vicinity. (iii) I have examined a large number of other samples of Leda clay and till from eastern Maine for microfossils without success. This absence of pollens elsewhere, together with their localized occurrence at Goose Cove, also indicates that these microfossils are indigenous to the Leda clay of Mount Desert Island.

A comparison of the pollen analysis of the clay from Mount Desert Island with the analyses by Wenner (*6*) of surface samples from the barren and wooded areas of Labrador shows a close similarity to the assemblages found in the forest area of southern Labrador. In this area, the pollens of birch, alder, willow, heath, and sedge—plants commonly found in the tundra areas farther north—are relatively rare, while the pollen grains of conifers are extremely high, as in the Leda clay of Maine.

Evidence that the eastern part of Maine was at least partly forested during the late glacial marine phase is given by Berry (*7*), who identified some fossil plants in the lower portion of shell-bearing Leda clays near Waterville (*8*).

Table 1. Pollen grains and spores found in Leda clay from Goose Cove, Mount Desert Island, Me.

Species	Percentage
Picea (spruce)	51
Pinus (pine)	28
Abies (fir)	7
Ulmus (elm)	1
Quercus (oak)	1
Tsuga (hemlock)	trace
Rosaceae cf. (rose family)	1
Gramineae (grass)	7
Fern spores	2
Spores (undifferentiated)	2

Among the plants identified were the leaves of balsam poplar (*Populus balsamifera*), which was the only plant found that has strictly northern affinities. This tree is now distributed from the forest area of Labrador south to northern New England. The rest of the plants identified are shrubs that have a more southern distribution and are also common in Maine at the present time. On the basis of these plant remains, Berry came to the conclusion that, during the marine submergence, the climate of southeastern Maine was similar to that of today.

Thus, from the evidence of the fossil plants and pollen, it seems probable that extensive forest growth existed in eastern Maine during the marine submergence in late glacial time and that the climate, as deduced from the flora of the clays, was at least as warm as that of southern Labrador today.

ARTHUR S. KNOX
U.S. Geological Survey, Washington, D.C.

References and Notes

1. D. Blaney and F. B. Loomis, *Am. J. Sci.* 42, 399 (1916).
2. A. S. Knox, *Science* 95, 307 (1942).
3. R. W. Sayles and A. S. Knox, *Bull. Geol. Soc. Amer.* 54, 1569 (1943).
4. E. S. Deevey, Jr., *Am. J. Sci.* 249, 177 (1951).
5. A. S. Knox, *Am. J. Botany* 35, 805 (1948).
6. C. G. Wenner, *Geogr. Ann.* 29, 137 (1947).
7. E. W. Berry, *Torreya* 17, 160 (1917).
8. H. P. Little, *Bull. Geol. Soc. Amer.* 28, 309 (1917).

2 February 1956

Two Obscure Oyster Enemies in New England Waters

The American oyster, *Crassostrea virginica* (Gmelin), like many other pelecypod mollusks, is attacked by numerous enemies. Of these, the common starfish, *Asterias forbesi* (Desor), and two species of drills, *Urosalpinx cinerea* (Say) and *Eupleura caudata* (Say), are best known. Certain other enemies, perhaps because they are less striking in appearance, are comparatively small or, because they are not easily observed, are little studied and their activities are virtually unknown. This is true of the two forms which I have been recently observing in New England waters and which may be responsible for several "mysterious" mortalities of oysters, especially the young. One of these enemies is a flatworm and the other is a gastropod.

The worm is the polyclad, *Stylochus ellipticus* (Girard), identified by Libbie H. Hyman of the U.S. National Museum. It is usually found among oysters and old shells, on barnacles, and under rocks. Although the biology and destructiveness of the closely related species, *Stylochus inimicus* (Palombi), the so-called oyster "leech" of southern waters, have been extensively studied by several investigators, including Pearse and Wharton (*1*), very little is known of many aspects of the biology of *S. ellipticus* of New England waters, and the extent of its predation on our oysters has never been systematically observed or accurately estimated.

Our recent studies suggest that *S. ellipticus* plays a rather important role in the destruction of oysters, especially young ones. Laboratory observations have shown that the worms have little difficulty in entering and killing spat, even those measuring more than 2.5 in. in length. In one experiment, when ten worms were placed in the same dish with 30 healthy spat averaging about 1.7 cm in length, the worms killed 21 spat in less than a month. Not a single spat died in the control tray during that period. On at least two occasions, we saw the worms entering slightly open oysters. A day or two later, these oysters were gaping and soon died. A single worm was found in one oyster, and in the second, three worms were feeding on the oyster meat.

Since *S. ellipticus* has been found in comparatively large numbers in many areas where oysters grow, it, no doubt, can present an important problem. This contention is supported by Woelke's (*2*) finding that a closely related form, *Pseudostylochus* sp., causes extremely heavy mortality among three species of oysters grown on our Pacific Coast. Obviously, to gain the necessary information on the destructiveness of *S. ellipticus* and to devise methods for its control, more extensive studies of its life-history and ecological requirements are imperative.

The second enemy is a small gastropod, which was identified by Fritz Haas of the Chicago Natural History Museum as *Menestho* (*Menestho*) *bisuturalis* (Say). By some experts this gastropod is still placed within the genus *Odostomia*. It is a small, whitish snail that seldom reaches the size of 5.0 mm and is often found in shallow water. It belongs to the family Pyramidellidae. Fretter and Graham (*3*),