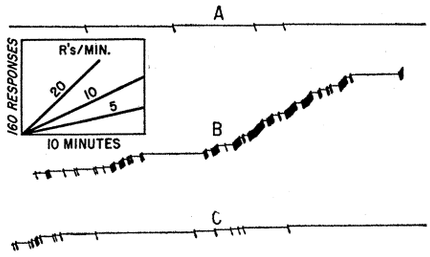

Fig. 3. Continuous records of self-stimulation of fish 16 at 125 μa. *A*, Light off and target inoperative. *B*, Light on and target operative. *C*, Light off and target inoperative. Each response is marked both by an upward motion of the pen and a reinforcement pip. The inset gives the scale of responses versus time.

at any particular time. The animal was thus free to receive or avoid the stimulus. The data are expressed as the percentage of the total time (50 minutes) which the animal spent on the side associated with the stimulus. A side preference could be associated with factors other than the stimulus. For instance, there may have been a marked preference for one side of the tank which was manifest only during the alternate 5-minute intervals when the cue light was off. This and other possible factors could conceivably result in percentages between 25 and 75, and therefore a percentage less than 25 was taken as a definite indication of negative reinforcement, and a percentage greater than 75 was taken as a definite indication of positive reinforcement. The results with three fish are shown in Fig. 1. For fish 19 the stimulus became progressively more aversive with increasing current intensity. In fish 21 the stimulus was neutral up to 150 μa, when it became aversive, and in fish 16 it was neutral except at 125 μa when it was a positive reinforcement. The placements of these three electrodes are shown diagrammatically in Fig. 2.

After the side preference tests, each animal was tested in a free operant situation with a Lucite target in an arrangement similar to that used by Aronson and Herberman (*9*). Responses and stimuli were recorded with a Gerbrands cumulative recorder. If the animal had shown negative reinforcement in the previous tests, it was exposed to a Sidman type (*10*) avoidance schedule (stimulus-stimulus interval, 1 or 2 seconds; response-stimulus interval, 20, 30, or 60 seconds). The fish would strike the target to escape the stimulus, but not to avoid it. If the animal had shown positive reinforcement, it was allowed to strike the target to receive a stimulus when a cue light was on. When the light was off, the target was inoperative. Figure 3 shows a typical result with fish 16 at 125 μa. In the upper record, the target was inoperative and the animal responded five times in 35 minutes. This was followed immediately by a test series, shown on the center record, when the target was operative. There were 174 responses in 31 minutes. This series was followed by another control period, the lower record, with 28 responses in 35 minutes.

Of the 13 fish tested so far nine placements have been negative and three positive at one or more current intensities, and one has been neutral between 5 and 150 μa (*11*).

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18 December 1961

Preservation of Old, Waterlogged Wood by Treatment with Polyethylene Glycol

Abstract. The excessive cracking and distortion that old waterlogged wood undergoes when it is dried can be substantially reduced by treating the wood with polyethylene glycol. The process was used to dry 200-year-old waterlogged wood boats recently raised from Lake George, New York.

The preservation of waterlogged wood from archeological sites has long been a problem for the archeologist and museum conservator. Wood that has been removed from these sites generally develops cracks and flakes while it is being dried, and it undergoes severe changes in dimension and shape.

Various techniques have been developed to counteract this degradation (*1*), but many of them are cumbersome and too complex to use in the field. In the United States the problem of preserving large objects developed suddenly when remains of Colonial bateaux were found under the waters of Lake George, New York, in the summer of 1960. A few of these 200-year-old boats, from the French and Indian Wars and perhaps the Revolutionary War period, were raised by skindivers in the fall of 1960. Experimental work to determine whether such wood could be successfully treated was carried out jointly by the Adirondack Museum, Blue Mountain Lake, N.Y., and the U.S. Forest Products Laboratory, Madison, Wis.

The results of this work showed that the severe degrading of old waterlogged wood, which normally occurs during drying, can be eliminated or greatly reduced by treatment with polyethylene glycol.

The wood used in this study was from the boats that had been raised from Lake George. The material consisted of ½- and 1-inch-thick sections of planking identified as white and yellow pine and short lengths of white oak that were used in the ribbed structure. The wood was kept water-soaked until it was treated. The white oak was quite sound except for surface decay. The white pine, however, was badly decayed; boards 2 and 3 feet long were difficult to handle without breakage. Yellow pine was intermediate in degree of deterioration.

Polyethylene glycol (mol. wt. 1000) (*2*) in 50-percent aqueous solution was used to treat the wood. The waterlogged sections (12-inch lengths) were soaked in the solution at room temperature for periods ranging from 4 hours to 1 week, and by multiple dip treatments. The treated wood was then air dried at 80°F and 30 percent relative humidity. Control specimens without previous treatment were dried in a similar manner.

Shrinkage in width of the untreated specimens was of the order of 5 to 7 percent, but shrinkage of the specimens treated for 2 to 7 days was approximately 0.5 percent. When the treatment period was shorter (4 to 24 hours), the subsequent shrinkage on drying was 2 to 4 percent, because the diffusion of the chemical was incomplete. However, the degree of surface

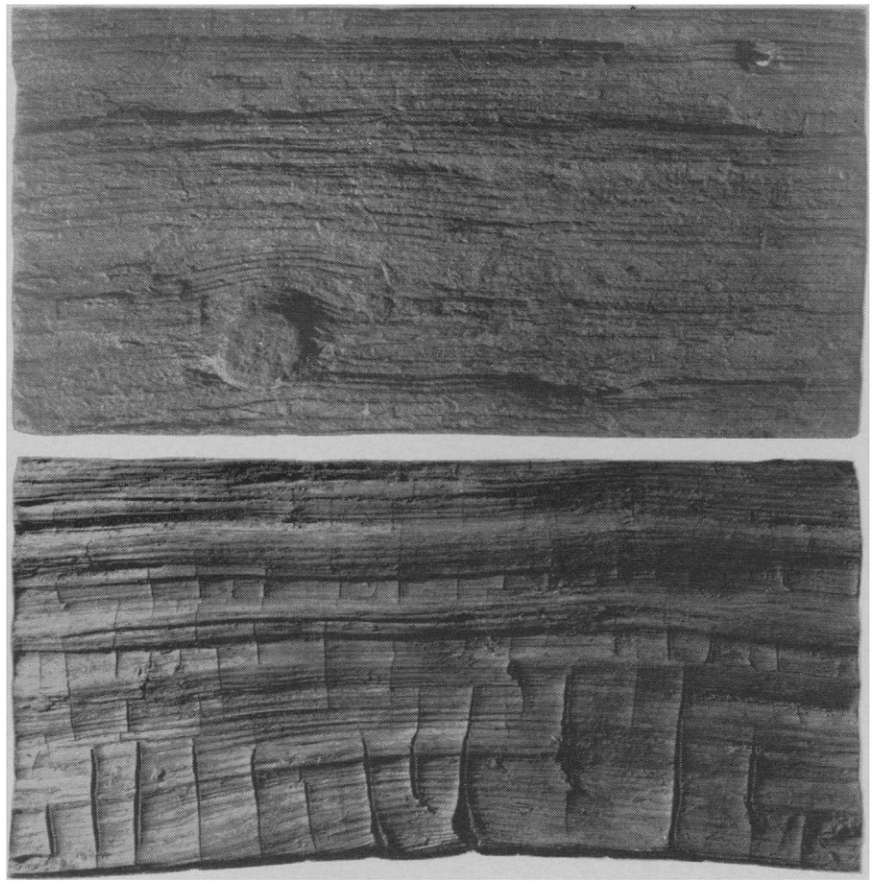

Fig. 1 Treated (top) and untreated (bottom) sections of a waterlogged white pine board (200 to 300 years old) raised from Lake George. The treated section was soaked for 1 week in 50-percent polyethylene glycol, then air-dried. The untreated section was air-dried.

checking was markedly reduced by treatment, regardless of the duration (4 hours to 7 days). The soaking period that will give the desired reduction in shrinkage and checking of the specimen depends on the size of the wood pieces and on the extent of wood decay.

The effect of polyethylene glycol treatment on face checking is clearly shown in Fig. 1. The top part shows a section of a white pine board that was soaked for 1 week in 50 percent polyethylene glycol and then air dried. No noticeable checking occurred during drying. The picture at the bottom shows the severe checking of an adjacent section that was air-dried from the waterlogged condition without treatment.

This study was limited to treating wood with polyethylene glycol having a molecular weight of 1000. Wood treated with polyethylene glycol-1000 becomes damp under high moisture conditions (above 80 percent relative humidity) and tends to "bleed" or "sweat" at 90 percent relative humidity (*3*). Polyethylene glycol of a molecular weight greater than 1000 may have a slight advantage for treatment of wood because it is somewhat less hygroscopic than that we used. For wood decayed to the extent that it is difficult to handle without crumbling, polyethylene glycol of a higher molecular weight may also have the advantage of imparting greater rigidity to the wood. The reduced solubility of polyethylene glycol with a higher molecular weight can easily be overcome by a moderate increase in temperature.

Processing of the actual bateaux was started in the field in the summer of 1961. The bateaux were kept under wet sawdust during the winter of 1960–61. A wooden tank big enough to contain the largest section of a bateau was constructed and lined with a sheet of polyethylene. Polyethylene glycol-1000 in a 50-percent aqueous solution was used for treatment. Half sections and planks were soaked for 3 days and then removed for drying. In over 3 months' drying time a minimum of hair-like surface cracks developed. The wood remained slightly damp to the touch, but has become firmer and is less susceptible to damage than it was when it was removed from the water. No shrinking or change of shape is apparent.

The treatment thus proved to be very valuable. Before treatment, these bateaux had to be handled with utmost care and constantly supported throughout their length and breadth. Slight pressure caused compression and subsequent collapse of cells. After treatment, however, it is now possible to handle these craft and reconstruct their lines.

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15 December 1961

Acquisition and Extinction of the Classically Conditioned Eyelid Response in the Albino Rabbit

Abstract. Comparisons of the performance curve of a classical conditioning group with the curves of control groups provided unequivocal evidence that elicitation of eyelid responses to the conditioned stimulus was acquired by associations formed between the conditioned stimulus and the unconditioned stimulus.

The eyelid reflex elicited by stimulation of the cornea is a prompt, stable response which does not appear to show qualitative variations in different mammals (*1*). Nevertheless, the litera-