Pudovkin's *Mechanics of the Brain*

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1 Introduction

What you are about to see are excerpts from a silent film by the famed Russian director Pudovkin, who had considerable success with a number of feature films in the 1920s and 1930s. This film, the title of which is variously translated as *Functions of the Brain* or *Mechanics of the Brain*, was shot in the mid 1920s in Pavlov's lab and at other locations. The film was apparently remade in the early 1930s; I do not know which version this copy represents.

Pudovkin apparently wanted to portray the modern understanding of how the brain functions, and how the conditioned reflexes that Pavlov and his students were examining could explain all complex behavior. The full-length film includes a lot of material about the physiology of spinal reflexes, including lots of footage of unfortunate frogs in various states of dismemberment. It also contains footage of various animals (ranging across the phylogenetic scale from reptiles through birds to various mammals, including cows, hippos, elephants, and some primates) engaged in feeding behavior, presumably intending to show the increased variety and flexibility of behavior afforded by a more complex brain.

2 History of the Film

The video that you will see is a tape of a tape of a tape of a filmed copy of the original (and perhaps several other generations should be interposed in there). The quality of the image reflects the fact that it has been copied multiple times.

The exact account of the arrival of this film in the U.S. is vague and uncertain. One account holds that the film was shown by Pavlov at the International Congress of Physiology in the late 1930s, and left by him when he returned to Russia. Another account states that the film was smuggled out of Russia in 1-foot-long strips, then spliced back together. The somewhat disjointed nature of the "story-line" suggests that something like this might have happened – upon viewing the film one gets the idea that things are out of order. I have two different versions of this film, one about 45 min long and the other about 70 min (presumably including an additional reel of the original). I suspect that the 70 min long version has rearranged the

order of the reels (compared to the director's intent) but I have not been able to determine in fact if this is the case.

The film was copied in the early 1960s by the library of the Sinai Hospital of Detroit. Several long introductory paragraphs of text were added, explaining how the hospital came into possession of film and acknowledging those who funded the copying. English translations of the Russian explanatory notes were inserted throughout the film. A series of still photos of Pavlov and some buildings relevant to his life and studies was added at the beginning of the film (at least I believe they were added at this time – they seem very different in style from the rest of the film, and I think the only credits for the photos are given in English, not Russian). Shortly after the copy was created, the original was destroyed because it was shot on a nitrocellulose-based film stock, which becomes explosive as it ages.

3 Narrative of the Film

3.1 Opening

The film opens with several paragraphs of text explaining how the film came into the possession of the library at Sinai Hospital of Detroit.

3.2 Still Photos

A series of still photos follows. They show Pavlov at various points in his life, engaged in various activities. Buildings associated with his work are also included among the photos.

3.3 Classical Conditioning in Non-Human Animals

Caution: portions of this segment might be disturbing to some viewers. The dog is in no pain because of the fistula, but it looks a bit troubling. A salivary fistula is created (one of the salivary ducts is brought to the outside of the dog's cheek) and a metal "slide" is attached temporarily with glue. The slide will allow saliva to run down into a test tube that has been suspended from the slide.

The effects of various types of foods on salivation are examined. The relatively simple take-home message here is that dry food produces more salivation than does wet food.

Caution: the next segment shows a dog being shocked, and struggling somewhat. It will be troubling to some viewers. A leg flexion reflex is presented schematically. Then we see a scene of a dog learning to associate the sound of a metronome with an electric shock to its foreleg. The shock elicits an unconditioned response, including flexion of the leg and some struggling. The metronome itself

causes no response, but after it has been paired with the shock then the sound of the metronome causes a conditioned response similar to the response elicited by the shock.

Next a dog learns to associate the sight of a vial of acid (almost certainly citric acid [lemon juice]) with the experience of the acid in the mouth.

Evidence is presented that the dog will learn to associate the sight of food with the experience of food in the mouth; the dog starts to salivate to the sight alone.

A metronome paired with food comes to elicit salivation because it has been paired with food (Watch for the dripping saliva). Extinction of this CR is ten shown.

An injection of morphine produces salivation and panting (dyspnea). These responses become conditioned to the CS of being wiped with cotton (which occurred prior to the injection.

Next we see an example of discrimination (differentiation). A monkey learns to associate one tempo of a metronome with food, a different tempo with no food.

Then we see the monkey learn to associate one color with food, another one with no food.

3.4 Human Classical Conditioning

Troubling, in part because of the clear ethical implications of the scene. We see a human subject with a salivary fistula, and we see unconditioned salivation to moist and dry bread.

Next a child learns to associate a somatosensory stimulus on his arm with the delivery of a cookie into his mouth. The conditioned response in this case appears to be the opening of the mouth in anticipation of the cookie, but this is not terribly clear. The acquisition, extinction, and re-acquisition of the CR are shown. Then differentiation (discrimination) is illustrated: the child learns to differentiate between two tempos of the metronome.

3.5 Development of Motor Behavior in Children

We see a woman in the throes of childbirth, and a demonstration of several unconditioned reflexes in the newborn.

Several scenes occur showing children at different ages engaged in several different behaviors, including eating, washing, playing, and solving a problem.

3.6 Comparing Behaviors of Mentally Retarded Adult with 1-Year Old

Troubling to me, mostly because of voyeuristic nature of the scene. The behavior of an "idiot" (this was a technical term in the first half of the 1900s, meaning an adult with a mental age below 3) is compared to that of a 1-year-old child.

4 Conclusion

Then the film ends abruptly – evidence, I think that this reel is not the intended final reel of the film. Anyone interested in the history of film is welcome to join me in trying to determine the sequence of scenes intended by Pudovkin.