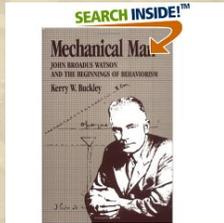
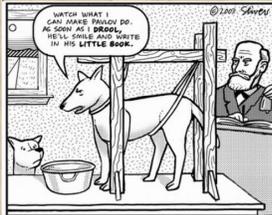


## The Behaviorist Revolution: Pavlov and Watson



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### Clicker Question

As a physiologist, what did Pavlov identify as the shortcoming of the cerebral cortex (hemispheres; brain) studies of his time?

1. They failed to apply the methods of psychology to understanding the cerebral cortex
2. They failed to apply Descartes' notion of a reflex to the cerebral cortex
3. They failed to heed Descartes' argument that mind is different from the brain
4. Researchers lacked any tools for manipulating the brain

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### Ivan Petrovich Pavlov: Physiologist



Trained in physiology at St. Petersburg and Leipzig (Carl Ludwig)

- First research on circulation and blood pressure
- Subsequently, *in vivo* study of the physiology of the digestive system using fistulas

Research focused on the role of nervous system in controlling digestive processes

Nobel Prize for Physiology of Medicine (1904) for his work on digestion



Discovered and set out to investigate "psychic secretion"—secretion in response to food stimuli located at a distance

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## Reflex Conception of Nervous System



- “Our starting point has been Descartes' idea of the nervous reflex. This is a genuine scientific conception, since it implies necessity. It may be summed up as follows: An external or internal stimulus falls on some one or other nervous receptor and gives rise to a nervous impulse; this nervous impulse is transmitted along nerve fibres to the central nervous system, and here, on account of existing nervous connections, it gives rise to a fresh impulse which passes along outgoing nerve fibres to the active organ, where it excites a special activity of the cellular structures. Thus a stimulus appears to be connected of necessity with a definite response, as cause with effect. It seems obvious that the whole activity of the organism should conform to definite laws.”

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## Reflex Mechanism

- “Reflexes are the elemental units in the mechanism of perpetual equilibration. Physiologists have studied and are studying at the present time these numerous machine-like, inevitable reactions of the organism—reflexes existing from the very birth of the animal, and due therefore to the inherent organization of the nervous system. . . . physiologists are succeeding more *and* more in unravelling the mechanism of these machine-like activities of the organism, and may reasonably be expected to elucidate and control it in the end.”



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## Clicker Question

What is Pavlov's example of the freedom reflex?

1. The tendency of young dogs to oppose their parents
2. The resistance of a dog to stay in a stand with loose loops around its legs
3. The distinctive reflex of humans to resist being controlled by others
4. The universal response of all animals to avoid starvation and thirst

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## Range of Reflexes

- *freedom reflex*—the dog simply could not remain quiet when it was constrained in the stand
- *investigatory reflex*—the dog would immediately orientate its appropriate receptor organ in accordance with the perceptible quality in the agent bringing about the change, making full investigation of it.

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## Salivation Reflex

- “Reflex due to the physical and chemical properties of a substance when it comes into contact with the mucous membrane of the mouth and tongue.”
  - “a similar reflex secretion is evoked when these substances are placed at a distance from the dog and the receptor organs affected are only those of smell and sight.”
  - “Even the vessel from which the food has been given is sufficient to evoke an alimentary reflex complete in all its details; and, further, the secretion may be provoked even by the sight of the person who brought the vessel, or by the sound of his footsteps.”



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## Need for More than Inborn Reflexes

- “The inborn reflexes by themselves are inadequate to ensure the continued existence of the organism, especially of the more highly organized animals, which, when deprived of their highest nervous activity, are permanently disabled, and if left to themselves, although retaining all their inborn reflexes, soon cease to exist. The complex conditions of everyday existence require a much more detailed and specialized correlation between the animal and its environment than is afforded by the inborn reflexes alone.”

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## Signal Stimuli

- New stimuli (metronome sounds) come to initiate a reflex: "I have termed this new group of reflexes **conditioned reflexes** to distinguish them from the inborn or **unconditioned reflexes**. The term "conditioned" is becoming more and more generally employed, and I think its use is fully justified in that, compared with the inborn reflexes, these new reflexes actually do depend on very many conditions, both in their formation and in the maintenance of their physiological activity."
- Mechanism: formation of new connections in the nervous system

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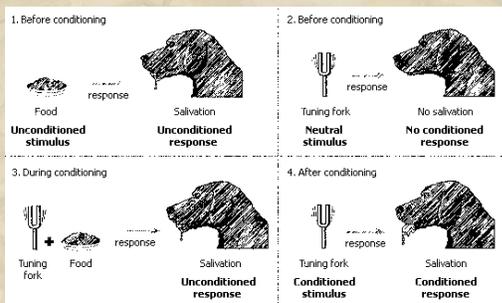
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## Classical conditioning



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## Backdrop to Behaviorism: Titchener's Structuralism



- Edward Titchener, a student of Wundt, developed a program at Cornell known as *structuralism*
  - Involves reporting on the contents of your own mental states
    - Develop a table of mental elements
    - Account for other mental states as molecules built of these elements by association
    - Requires training in introspection (only practiced subjects are able to give reliable results)

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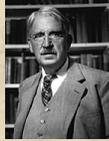
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## The Backdrop to Watson: Functionalism at the Univ. of Chicago

John Dewey, like James, was influenced by both Peirce and Darwin

Moved to the University of Chicago in 1894, bringing George Herbert Mead, Addison W. Moore, and James Rowland Angell



Contrast with structuralism: rejected elementarism  
Rejected the reflex arc in favor of more holistic, adaptive view: a reflex is an instrument "for successful coordination"

Focus on the use of mental processes in activities of life

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## John Watson

Frustration with the functionalists at the University of Chicago  
Sought refuge in Jacques Loeb and his studies of tropism in plants and animals



Dissertation on the relation between behavior in the white rat and the growth of the nervous system  
Title: Animal Education: The Psychological Development of the White Rat: focused on the (non-) relationship between brain myelinization and ability to learn

Emerging view: "Can't I find out by watching...[animal] behavior everything that the other students are finding out by using [human] O[bserver]s?"

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## Clicker Question

What was Watson's view about human conscious experience?

1. Consciousness is the proper focus of psychological investigation
2. From behavioral studies investigators will be able to construct the conscious state of their subjects
3. The study of behavior should replace the study of consciousness in psychology
4. Consciousness emerges when the natural equilibrium is disturbed and choice is needed

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## Clicker Question

Which of the following is to have no place in psychology as envisioned by Watson

1. Mental images
2. Stimulus and response
3. Habit formation
4. Hereditary adjustments

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## Watson's Manifesto

- Work on animal behavior has been viewed as irrelevant to psychology focused on consciousness
  - “It seems reasonably clear that some kind of compromise must be affected: either psychology must change its viewpoint so as to take in facts of behavior, whether or not they have bearings upon the problems of 'consciousness'; or else behavior must stand alone as a wholly separate and independent science. Should human psychologists fail to look with favor upon our overtures and refuse to modify their position, the behaviorists will be driven to using human beings as subjects and to employ methods of investigation which are exactly comparable to those now employed in the animal work.”



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## Comparison with Darwin

- Prior to Darwin, evolution focused on the ascent to humans
  - The great chain of being
- After Darwin, different branches in the tree of life all of equal interest
  - Human evolution just one specialized topic
- For Watson, animal behaviors of all sorts are legitimate foci of study



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## Circumventing Mind-Body Problem

“One of the difficulties in the way of a consistent functional psychology is the parallelistic hypothesis. . . . I feel that *behaviorism* is the only consistent and logical functionalism. In it one avoids both the Scylla of parallelism and the Charybdis of interaction. Those time-honored relics of philosophical speculation need trouble the student of behavior as little as they trouble the student of physics. The consideration of the mind-body problem affects neither the type of problem selected nor the formulation of the solution of that problem. I can state my position here no better than by saying that I should like to bring my students up in the same ignorance of such hypotheses as one finds among the students of other branches of science.”

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## Watson's Positive Program

- “I believe we can write a psychology, define it as [the science of behavior] and never go back upon our definition: never use the terms consciousness, mental states, mind, content, introspectively verifiable, imagery, and the like. . . . It can be done in terms of stimulus and response, in terms of habit formation, habit integrations and the like. Furthermore, I believe that it is really worth while to make this attempt now.”
  - Study of bird species in Dry Tortugas Islands (Florida)
  - Study of aboriginals of Australia
  - Study of Europeans
- Domains in which this has been successful: experimental pedagogy, the psychology of drugs, the psychology of advertising, legal psychology, the psychology of tests, and psychopathology

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## Studying Ebbinghaus' Spacing Effect Behaviorally

- With rats, vary whether they are trained in single episode or over several shorter episodes
  - Dependent variable will be behavior (accuracy of later performance)
- “We need to have similar experiments made upon man, but we care as little about his 'conscious processes' during the conduct of the experiment as we care about such processes in the rats.”
- Conduct psychophysics experiments similarly
  - Dependent variable not introspection but behavior

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## Conditioned Emotional Responses

- Children have a fairly narrow range of emotional responses; adults have a broader range
  - Conditioning should account for the difference
- At outset of study, Albert B showed no emotional reaction to “a white rat, a rabbit, a dog, a monkey, with masks with and without hair, cotton wool, burning newspapers”
- At nine months, Albert exhibited fear response to hammer struck a steel bar
- Associate hammer striking with touching a white rat
- Response generalized (rabbit, dog, Santa Claus mask) and persisted



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## Long Term Effects

- “The Freudians twenty years from now, unless their hypotheses change, when they come to analyze Albert's fear of a seal skin coat - assuming that he comes to analysis at that age - will probably tease from him the recital of a dream which upon their analysis will show that Albert at three years of age attempted to play with the pubic hair of the mother and was scolded violently for it. (We are by no means denying that this might in some other case condition it). If the analyst has sufficiently prepared Albert to accept such a dream when found as an explanation of his avoiding tendencies, and if the analyst has the authority and personality to put it over, Albert may be fully convinced that the dream was a true revealer of the factors which brought about the fear.”

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## Clicker Question

How do you think James would have responded to Watson's manifesto

1. Behavior without consciousness has no relevance to psychology—Watson is a mere biologist
2. Consciousness can be studied by the “behaviorist”—study its effects on behavior
3. Watson and I agree—the development of habits is fundamental to behavior of mice and humans

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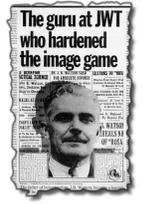
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## Fast Rise, Fast Fall

- Watson earned his Ph.D. at U. Chicago in 1903 and joined the faculty
- Appointed full professor and chair at Johns Hopkins in 1908
- President of the American Psychological Association in 1915
- Affair with research assistant Rosalie Rayner ended his academic career in 1920
- New career in advertising but still not defeated: *"Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in, and I'll guarantee to take any one at random and train him to become any type of specialist I might select—a doctor, lawyer, artist, merchant-chief, and, yes, even into a beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors."* [Watson, 1924, p. 10]



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