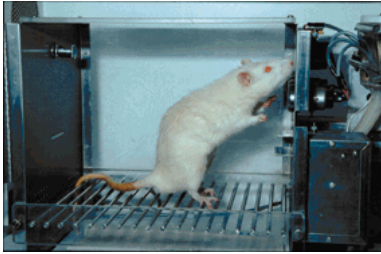
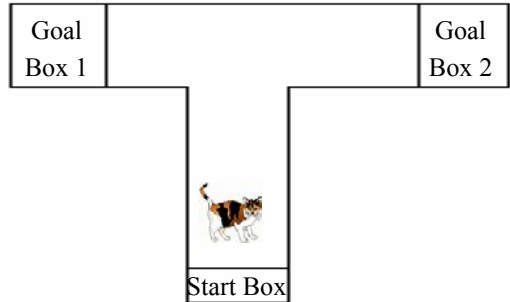




### Rat in Skinner Box



### Instrumental Conditioning: Maze Learning Tasks



### Defining Reinforcement & Punishment

	Event Occurs	Event Omitted
Frequency of Behavior Increases	<b>Positive Reinforcement</b> <i>Appetitive Event</i>	<b>Negative Reinforcement</b> <i>Aversive Event</i>
Frequency of Behavior Decreases	<b>Positive Punishment</b> <i>Aversive Events</i>	<b>Negative Punishment or Omission</b> <i>Appetitive Events</i>

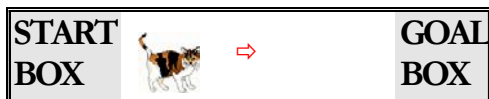
### Discrimination Learning

#### ⌘ Discriminative Stimulus

- ♦ *stimulus presented to signal the operation of a given schedule of reinforcement*
- ♦ *stimulus comes to control behavior*
  - *behavior occurs in the presence of the stimulus*
  - *behavior does not occur when the stimulus is absent*

⌘ Application: Evaluating the perceptual abilities of animals

### Instrumental Conditioning: Straight Runway



### Escape & Avoidance Learning

#### ⌘ Escape

- ♦ *Signal Presented, followed by delivery of shock*
- ♦ *Animal must make a response to terminate a shock*
  - *e.g., press a bar to turn the shock off*

#### ⌘ Avoidance

- ♦ *Signal Presented, followed by delivery of shock after a short interval*
- ♦ *If a response is made before the end of the interval, no shock will be delivered*
  - *e.g., press a bar to prevent onset of the shock*
- ♦ *Passage of time can serve as the signal*
  - *e.g., rat must respond every 2 sec to avoid shock*

## Operant Procedures

### ☞ Rats: Bar Press Response

- ♦ *dependent measure: rate of responding*

### ☞ Pigeons: Key Peck Response

- ♦ *dependent measure: rate of key pecking*

### ☞ Human Research

- ♦ *may examine key pressing, lever pressing, etc.*
- ♦ *Applied research usually targets some practical behavior*

## Schedules of Partial Reinforcement: Fixed Schedules

### ☞ Fixed Ratio Schedule

- ♦ *1 reinforcement delivered for completion of a specific number of responses*
- ♦ *FR 10*
- ♦ *Post-Reinforcement Pause*

### ☞ Fixed Interval Schedule

- ♦ *reinforcement is delivered for completion of the first response at the end of a defined period of time*
- ♦ *FI 30 sec*
- ♦ *Scalloping*

## Shaping

☞ Reinforce successive approximations of the target response.

### ☞ Shaping language use in autistic children

- ♦ *vocalization*
- ♦ *vocalization that sounds like a target word*
- ♦ *increasingly clearer approximations to the target word*
- ♦ *correct articulation of the target word*
- ♦ *once vocabulary established, begin work on meaningful sentences*

## Schedules of Partial Reinforcement: Variable Schedules

### ☞ Variable Ratio Schedule

- ♦ *1 reinforcement delivered on average for each specified number of responses*
- ♦ *actual delivery of reinforcement occurs after variable numbers of responses*
- ♦ *VR 10*

### ☞ Variable Interval Schedule

- ♦ *reinforcement delivered after the first response made following a variable time interval*
- ♦ *average duration of the interval defines the schedule*
- ♦ *VI 30 sec*

## Delivery of Reinforcement

### ☞ Continuous Reinforcement

- ♦ *reinforcement delivered after every targeted response*

### ☞ Intermittent (Partial) Reinforcement

- ♦ *only a percentage of the targeted responses are reinforced*
- ♦ *can produce higher rates of responding*
- ♦ *responding is more resistant to extinction*

## DRL & DRH Schedules of Reinforcement

### ☞ DRL Schedules - differential reinforcement of low rates of responding

- ♦ *DRL 1 min*
  - *responses made sooner than 1 minute after last response reset clock (increases the delay)*

### ☞ DRH Schedules - differential reinforcement of high rates of responding

- ♦ *DRH 30 / min*
  - *animal must make at least 30 responses within a minute*
  - *slower response rates will reset the interval and prior responses will be useless for earning reinforcement*

## Multiple and Mixed Schedules

### Multiple Schedules

- ♦ chain two or more schedules
- ♦ each schedule will be signaled by a different stimulus
- ♦ VI 25 sec FR 20

### Mixed Schedules

- ♦ chain two or more schedules
- ♦ no signal presented as the animal moves from one schedule to the next in the chain

## Aversive Control of Behavior: When is punishment effective?

- ☞ Deliver punishment *immediately* after the target behavior
  - ♦ short delays minimize confusion about which behavior is being punished
- ☞ Punishment must be *severe enough to suppress* the targeted behavior
- ☞ Punishment must be delivered *consistently*
- ☞ Make punishment contingent on *only one target behavior* at a time
  - ♦ punishing multiple behaviors dilutes the effect
- ☞ Alternate behaviors that earn reinforcement must be available

## Concurrent Schedules

- ☞ Several schedules are in operation at the same time
- ☞ Each schedule is associated with a response on a particular device
  - ♦ two levers, one governed by VI 15 sec, one governed by FR 20
- ☞ Used to study choice behavior
  - ♦ matching law
  - ♦ the rate of responding to each device in a way that will match the proportion of reinforcements available on each schedule

## Negative Side Effects of Punishment

- ☞ Generalized suppression of *all* behavior
- ☞ Punishers elicit anger and aggressive behavior toward the source of punishment
- ☞ Motivates deceptive behavior
  - ♦ successful deception ⇒ escape or avoidance of punishment
- ☞ Problem of observational learning
  - ♦ person delivering the punishment serves as a model for the use of aggressive behavior to solve problems

## Factors that Influence Rate of Responding

- ☞ Magnitude of the Reinforcement
- ☞ Quality of the Reinforcement
- ☞ Contrast Effects
  - ♦ Crespi (1942)
- ☞ Delay of the Reinforcement

## Learned Helplessness Overmeir & Seligman (1967)

- ☞ Dogs first received unavoidable & inescapable shock
- ☞ Next, dogs were given avoidance training
  - ♦ jumping from one side of the apparatus to the other would now terminate shock and timely jumping would allow the dog to avoid shock
- ☞ Dogs exposed to noncontingent shock were impaired in their ability to learn an avoidance response
- ☞ These dogs also displayed passive, depressed behavior

**Application: Behavioral Training Methods  
(Pryor, 1984)  
Four “Bad Fairies”**

- ☞ Eliminate behavior by physically restraining the subject or by eliminating the subject.
- ☞ Punish the target behavior.
- ☞ Use negative reinforcement.
- ☞ Extinction.

**Application: Behavioral Training Methods  
(Pryor, 1984)  
Four “Good Fairies”**

- ☞ Reinforce an incompatible behavior.
- ☞ Put the behavior on cue. Reinforce the behavior in the presence of the cue only.
  - ◆ *Behavior will extinguish in absence of the cue.*
  - ◆ *Once under control of the cue, stop presenting the cue*
- ☞ Reinforce *absence* of the behavior.
  - ◆ *Reinforce any other acceptable behavior*
- ☞ Identify and change the motivation driving the behavior.

**Role of Biology**

- ☞ Bolles (1969) Species-specific defense responses
  - ◆ *some responses are learned more quickly as operants than are other responses*
- ☞ Instinctive Drift (Breland & Breland, 1961)
  - ◆ *intrusion of instinctive behavior that disrupts learning an operant response*
- ☞ Reinforcement Centers in the brain (Olds & Milner, 1954)
  - ◆ *electrical stimulation of the medial forebrain bundle can have a potent reinforcing effect*