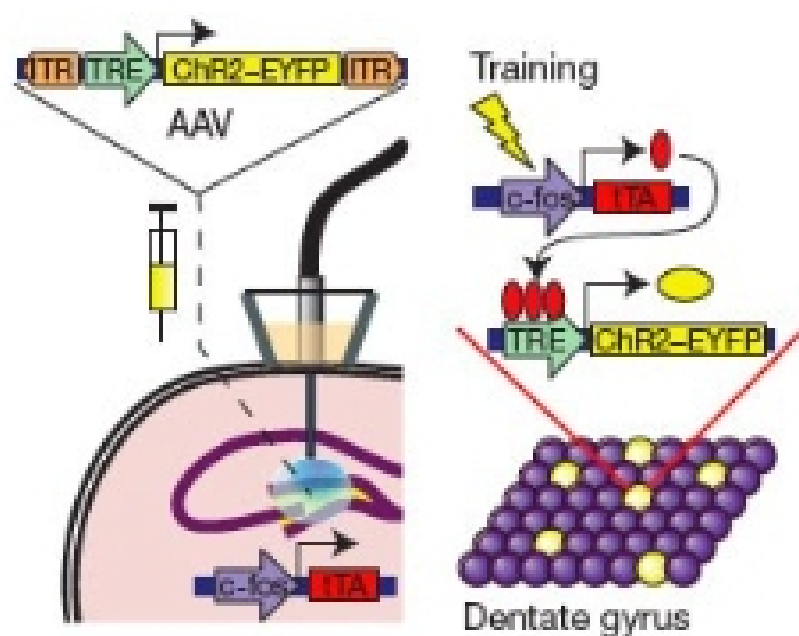


1. Making a smarter mouse: Doogie 3/31/15
 - a. Making a smarter mouse
 - i. Created mice that made the NR2B subunit of the NMDA receptor into adulthood
 1. NR2A (adult form)
 - a. Suppresses NMDA
 2. NR2B (juvenile form)
 - b. Exhibited enhanced LTP and learning
2. Optogenetics
 - a. Seek to activate cells involved in a specific memory
 - b. Uses a viral vector
 - i. A virus infects cells by binding to the cell membrane
 - ii. Only labels the active
 - c. Genes used:
 - i. Channelrhodopsin: Illumination allows Na ion to enter cell
 - ii. Halorhodopsin: illumination allows Cl⁻ influx
 - d. Placed under the control of tTA promoter



3. Use a viral vector to place gene in the hippocampus
 - a. Expression of tTA is coupled to cFOS (engaged by neural activity)
 - b. Remove DOX and trained in a distinct context (B)
 - i. Context --> shock
 - c. Replace DOX and test in a different context (A)
 - d. Illumination of the hippocampus elicited freezing (Liu et al., 2012)
4. Rat in environment A, take off DOX, train light w/ shock
 - a. Neurons that were active during the light/shock training, now have a flag/label when they are put back on DOX

ii. Procedure:

1. Put rat in context/environment B, shine a blue light, rat freezes
2. Shows that the hippocampus is not just sufficient, but it is also necessary for contextual learning

When R-O Relation Matters

I. Basic Properties

a. Criteria:

- i. Imposing a temporal relationship between a response and an outcome alters the response

b. Ways of studying instrumental behavior

		Nature of the Reinforcer	
		Appetitive	Aversive
Response-->Reinforcement		Reward	Punishment
Response-->No Reinforcement		Omission	Escape

i. Reward training- Appetitive

1. Aka positive reinforcement
2. Performing the response produces an appetitive stimulus
 - a. Schedules matter
 - b. Partial reinforcement principle
3. You get something you like when you respond
4. Increases behavior

ii. Omission training- Appetitive

1. Negative punishment
2. Performing the response prevents/eliminates the occurrence of an appetitive stimulus
3. When you do something, you get something you like taken away
4. Ex. kids getting timeout
5. Decreases behavior

iii. Punishment- Aversive

1. Positive punishment
2. Performing a response leads to an aversive stimulus
3. Something you don't want coming to you in response to something you did
4. Decreases behavior

iv. Escape- Aversive

1. Negative reinforcement
2. Response contingent shock
 - a. Performing a response eliminates/prevents the occurrence of an aversive stimulus
3. Ex. opening an umbrella takes away the rain drops getting in your face
4. Increases behavior

c. Phenomena

i. Common behavioral principals

1. Biological Preparedness
 - a. Ex. birds are biologically prepared to pair peck->food, treadle (pedal)-> shock; you can't pair peck-> shock and treadle->food
2. Adding extra (free) reinforcers degrades performance
 - a. US pre-exposure effect
 - b. Hard to pair things w/ US's that are known to not have
3. Learned helplessness
 - a. Consequence of prior exposure to a reinforcer alone
 - b. Much like US pre-exposure effect
 - c. Triadic design

i. Groups:

1. Master

- a. Has the ability to turn off the shock by turning the wheel
 - 2. Yoked
 - a. Is given the same thing as the master
 - 3. Unshocked
 - a. Not connected to either of the 2 other rats
 - ii. Tested in shuttle avoidance
 - 1. When you test latency (seconds it takes to jump over the shuttle to turn off the shock) in the 1st test (FR1) every group has about the same latency
 - 2. In FR2, when you have to jump over and then back, master and unshocked learn relatively the same; BUT THE YOKED GROUP just stops trying after jumping over once
 - a. Observe a behavioral deficit in a shuttle avoidance test (on FR2)
- d. Hypothesis:
 - i. Postulated by Maier and Seligman
 - ii. Motivational deficit
 - 1. Cognition of no control reduced incentive to escape
 - 2. They realize that from their previous experience that they have no control, so why would I try
 - iii. Associative deficit
 - 1. Knowledge of the lack of association between behavior and shock undermines new learning
 - 2. My behaviors didn't effect shock last time, so why would they this time
 - iv. Both of these are very interrelated...one can lead to another
- e. Therapy and immunization
 - i. Therapy
 - 1. R- restrained, I- inescapable, e=escapable
 - 2. R-R
 - 3. I-E: shows that they learn
 - 4. I-I: in FR2 they show that they learned
 - 5. I-R: in FR2 they show that they learned
 - 6. Reverses the deficit
 - ii. Immunization
 - 1. R-R: in FR2 group they learn
 - 2. E-I: in FR2 they don't learn
 - a. You have previous experience that they are able to control it
 - 3. I-I: in FR2 they don't learn
 - 4. R-I: in FR2 they don't learn
 - 5. Prevents the deficit
- f. Role of endogenous opioids
 - i. Could the animals just be analgesic?
 - 1. Tail flick test- measures latency for time it takes to move your tail
 - a. R: lowest latency
 - b. E
 - c. I: highest latency
 - ii. It's relation to depression
 - 1. Effect of endorphins
 - iii. Give an opioid antagonist, will you still see the same effect?
 - 1. Add naltrexone
 - 2. R:
 - 3. E:
 - 4. I: cuts the latency in half,
 - a. Makes them learn better, but not the only reason