

The intuition

MK

Background

Gulf War 1991

- ▶ Ships tasks:
 - ▶ Observe the airspace
 - ▶ Defend ships and personnel carriers

HMS Gloucester

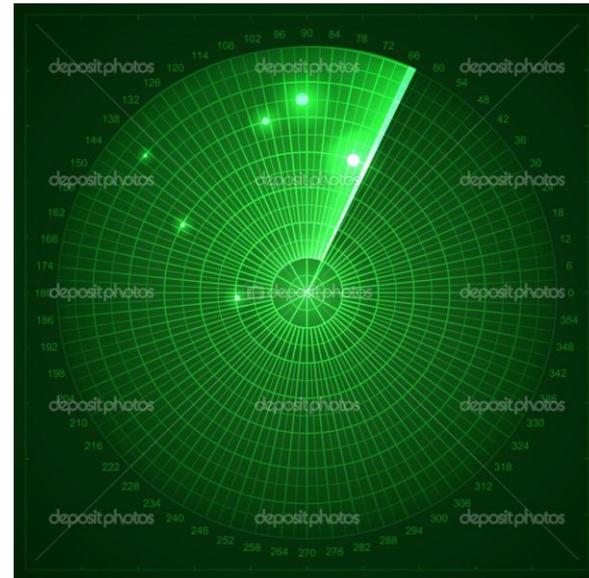


Situation

Lt Cmdr Michael Reilly

- ▶ Looks at radar or hours
- ▶ Sees a blip on a screen
- ▶ Has a significant visceral reaction:
 - ▶ Sweaty palms
 - ▶ Palpitations
 - ▶ Gets scared
- ▶ Unable to say if it is A-6 or Silkworm missile
- ▶ Decision???

Radar



To be or not to be....

Possible outcomes

- ▶ If he fails to shoot a Silkworm missile
 - ▶ USS Missouri will sink
 - ▶ Multiple casualties will happen
 - ▶ Court-martial
- ▶ If he shoots A6 American plane
 - ▶ 2 pilots will be killed
 - ▶ Few million dollars will be in damages
 - ▶ Court-martial

Decision



His Decision:

He fired the weapon



What happened next?

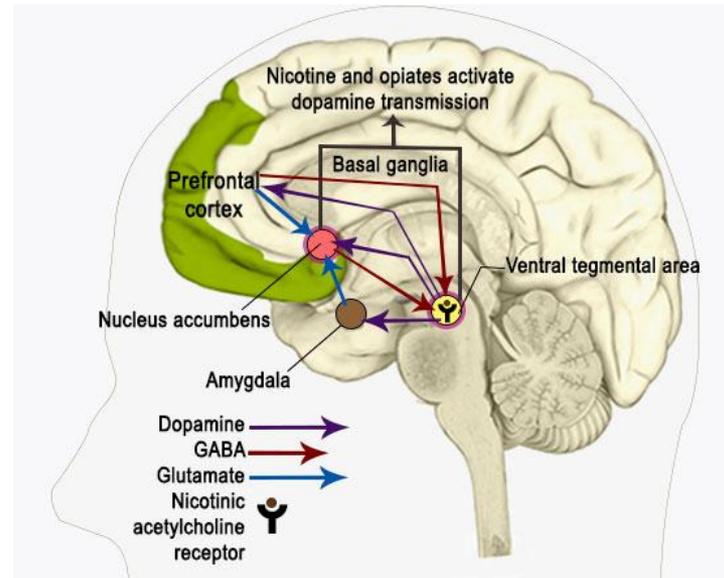
- ▶ He got suspended
- ▶ Under investigation
- ▶ To be continued....

The dopamine

The importance

- ▶ Discovered by accident
- ▶ 1954 James Olds & Peter Milner
- ▶ Inserted electrodes into Nucleus Accumbens (NAcc)
- ▶ NAcc generates pleasure
- ▶ Too much pleasure can be fatal

Nucleus Accumbens

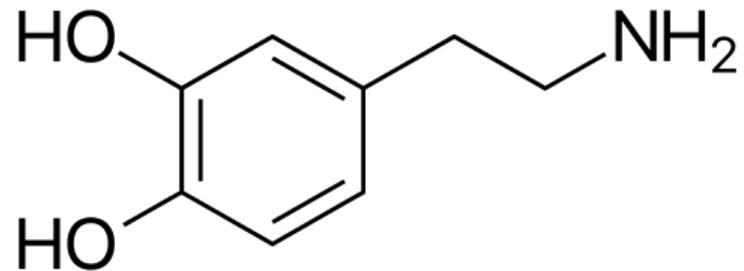


Dopamine continued

Reward system

- ▶ Rodents lost interest in
 - ▶ Food
 - ▶ Courtship behavior
 - ▶ Drinking
- ▶ All subjects huddle in the corner of the cage, transfixed in their bliss
- ▶ All perished from dehydration
- ▶ Dopamine regulates ALL emotions

Chemical structure



Dopamine and prediction

Dopaminergic prediction

- ▶ 1970-80's, Schultz
 - ▶ Loud tone
 - ▶ Few seconds of waiting
 - ▶ Reward (apple juice)
 - ▶ Noticed: Dopaminergic neurons fire BEFORE the reward
- ▶ If the pattern breaks:
 - ▶ the neurons send signal: ERROR
 - ▶ Brain amplifies the signal to send ALARM!!!

Happy monkey



The Alarm system of your brain

Prediction Error

- ▶ Error-related negativity signal emanate from ACC
- ▶ It forces an animal to notice unpredicted events and react to:
 - ▶ Loud sounds
 - ▶ Fast movement

Anterior Cingulate Cortex (ACC)

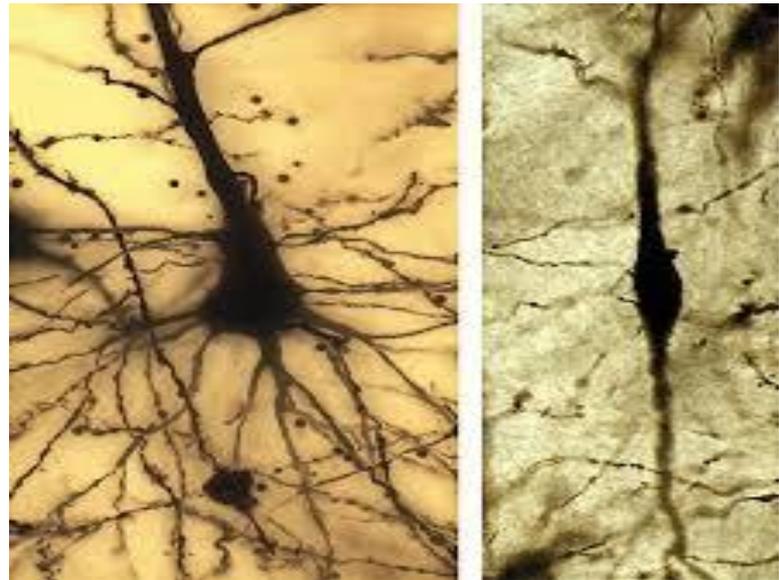


Role of Spindle Neurons

The Alarm in action

- ▶ ACC gets input from Dopamine neurons
- ▶ ACC sends signal via Spindle Neurons

Spindle neurons



Back to Lt CMDR Michael Reilly

The thing he shut down

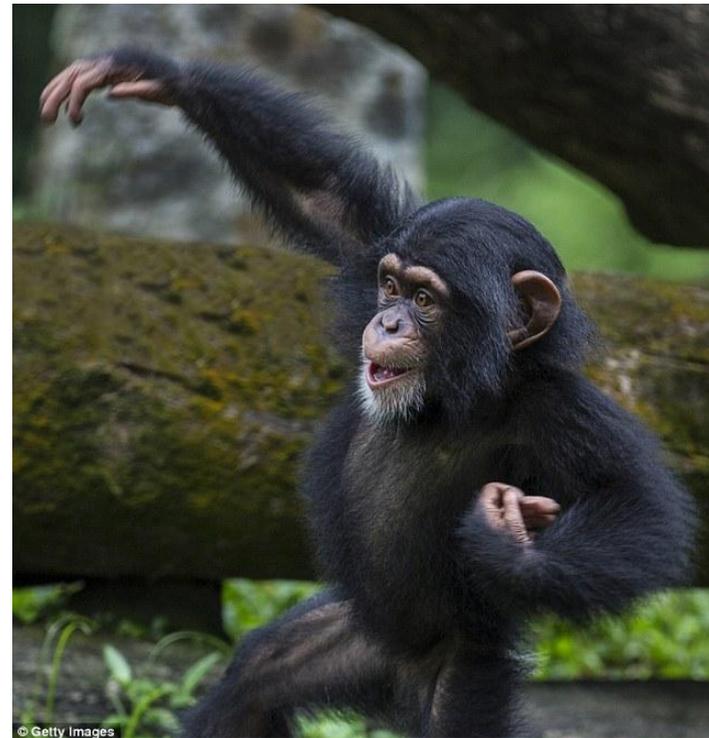


Follow up

- ▶ Navy investigation conclusion:
 - ▶ Pure luck
- ▶ Decision psychologist:
 - ▶ The silkworm missile didn't follow normal pattern for A6 plane.
 - ▶ It was flying lower
 - ▶ The radar picked it later, than A6 (it was closer to the center)
 - ▶ Subconsciously Michael was measuring the altitude of the missile

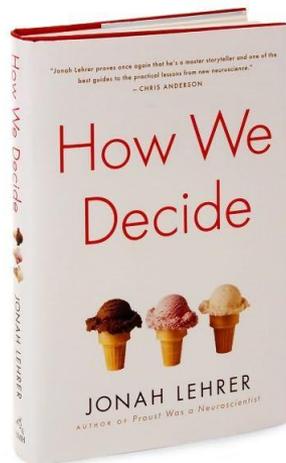
The point of the story

- ▶ Repetitive events follow a patterns
- ▶ Your brain gets rewards for making correct predictions
- ▶ When patterns are broken, an alarm goes off
- ▶ When you get experience listen to your inner monkey
- ▶ If your experienced staff goes ape**** over something you don't perceive as a big deal, take a second look



Prediction errors in action

I recommend



How do you feel?



Questions?

