

# TIME AND THE BRAIN

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## ① HOW DO WE KEEP TRACK OF TIME?

THERE ARE MANY CLOCKS IN OUR BODIES



BUT OUR "MASTER CLOCK" IS THE CIRCADIAN RHYTHM LOCATED IN THE SUPRACHIASMATIC NUCLEUS IN THE HYPOTHALAMUS.



TIME IS TRACKED BY A CYCLICAL MOLECULAR REACTION BETWEEN PROTEINS, WHICH IN TURN REGULATES THE HORMONE MELATONIN.



MELATONIN TELLS OUR BODY WHEN TO WAKE UP AND WHEN TO SLEEP.



OUR CIRCADIAN CLOCK HAS A PERIOD OF ITS OWN.



IF YOU SHUT SOMEONE FROM THE OUTSIDE WORLD, THEIR CLOCK WILL STILL TELL THEM WHEN TO SLEEP.

GENETICS DETERMINES THE BASE DURATION OF THIS CYCLE. EACH PERSON COULD HAVE A DIFFERENT PERIOD.



SUNLIGHT PROVIDES CHEMICAL CUES THAT REGULATE AND SYNC THIS CLOCK TO REGULAR EARTH DAYS.



WHICH IS WHY PEOPLE WITH JETLAG AND GRAD STUDENTS USUALLY HAVE TROUBLE SLEEPING.



## ② HOW DO WE PERCEIVE TIME?

WHAT DOES IT MEAN TO PERCEIVE TIME??

TECHNICALLY, THE PAST DOESN'T EXIST, SO WE CAN'T REALLY PERCEIVE IT...



AND THE FUTURE HASN'T HAPPENED YET, SO WE CAN'T HAVE EXPERIENCED IT EITHER.

YET, WE CAN ALL ATTEST TO A FEELING OF TIME.

FOR EXAMPLE,

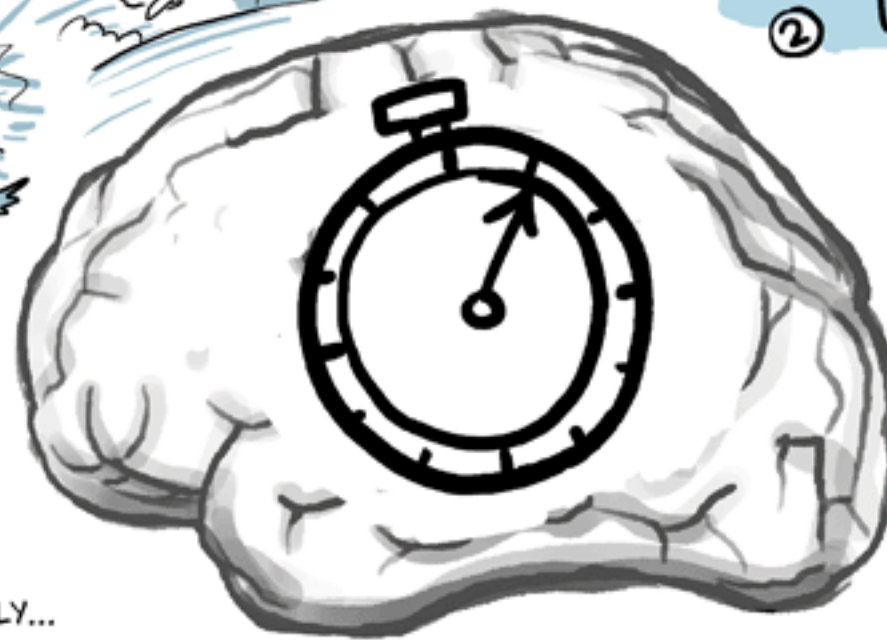
TIME MOVES...

REALLY SLOWLY...

WHEN YOU'RE DOING...

SOMETHING...

BORING.



BUT TIME MOVES REALLY FAST WHEN YOU'RE HAVING FUN.



SCIENTISTS BELIEVE SOME OF THE NEURAL CIRCUITRY THAT HELPS US FEEL TIME LIES IN AN AREA CALLED THE BASAL GANGLIA.

PARKINSON'S DISEASE AND ATTENTION DEFICIT-HYPERACTIVITY DISORDER ARE COMMONLY THOUGHT TO AFFECT THIS AREA.



## ③ FINALLY... HOW DO WE IMAGINE THE FUTURE?

OUR CAPACITY FOR IMAGINATION IS NOT NEW.

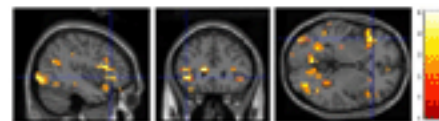


NOR IS IT UNIQUE TO HUMANS.



BIRDS, DOLPHINS AND MANY OTHER ANIMALS CAN USE THEIR IMAGINATION AND PLAN AHEAD.

MRI STUDIES HAVE SHOWN THAT YOUR IMAGINATION USES SOME OF THE SAME BRAIN AREAS AS YOUR SENSES.



AND CAN EVEN INFLUENCE YOUR PERCEPTION OF THE WORLD.

SCIENTISTS TELL US THAT USING YOUR IMAGINATION CAN ACTUALLY EXPAND YOUR BRAIN.



MENTALLY PRACTICING ACTIVITIES CAN MAKE YOU BETTER AT THEM IN REAL LIFE!

SPEAKING OF TIME, PSYCHOLOGISTS HAVE ALSO FOUND THAT CHRONIC PROCRASTINATORS ARE JUST AS GOOD AT JUDGING TIME AS NORMAL PEOPLE.

I'M JUST LATE BECAUSE I WANT TO!



TIME'S UP!