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## Genes: *Controlling Our Every Move*

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"Good morning all!" "Why the glum face?" said Larry.

Larry thought to himself:

Gosh, I don't remember the motor region in the spinal cord being so motionless, hahaha...oh I make myself laugh. Well, I guess I have to be truthful to myself too. I am a bit anxious about Bill's visit to the doctor; he's getting his results today. I wonder...

"Hey Larry" said Bob.

"Hi yeah, Bob. Ready for Bill's big day"

"The nucleus knows I am. I've been waiting to find out if Bill has ALS ever since he started having tingling in the hand."

"If only the darn motor neurons would let us know what was going on."

"Sure would raise our action potentials."

"Alright Larry, I have some neurotransmitters coming in, I'll exchange ions with you later."

I'm sure no one neuron had the impulse that one of us in the spinal cord would someday be useless.

After I was born from the All Mighty Stem Cells in the neural tube, I remember being amongst millions of other neurons. Soon after I began moving, an innate feeling came over me and I was off. I traveled down a highway filled with other neurons heading towards their own destinations— I grabbed on to Joey, a radial glial cell. After sometime, Joey left me with tropic molecules that showed my dendrites where to make my final movements before I could synapse, while my axon stayed put fairly close to the brainstem. When I synapsed with a motor neuron, Lucy, I soon after went through myelination to make sure that I could communicate with her quickly and effectively. Lucy and I knew that we were the perfect team—I had chemoaffinity for her from the start. I would get information from the motor cortex, then raise her action potential, and she would make Bill's arm move— we felt as if we would never let Bill down. She and I have looked out for him for the past 62 years, but I still feel as though I have failed him. We never expected this to happen then, everything was going so smoothly. By the 4th week, I'm sure there were at least 500,000 neurons being produced every minute and his heart was thumping away at the 24th week. Bill was a lucky little embryo.

His heart has been thumping strong ever since, I wouldn't be surprised if it hasn't become stronger. There was a small rise in blood pressure during a few stressful years, who could blame him? When Bill was 40 his mother died from breast cancer (he participates in breast cancer runs every year) a year later his father died from ALS. That year the motor neurons told us that they had some situations with chromosome number 21. They said something about the chromosome having some sort of mutation that did not allow it to encode for superoxide dismutase (SOD), a protein that helps fight foreign invaders that attack motor neurons. Unfortunately, no one took it into consideration, because up until now, no one realized how devastating the lack of SOD could be.

"Larry, Larry, chemicalgram just came in that confirmed Bill has ALS. They said that the motor neurons are deteriorating, but not you interneurons up here. So, don't get

yourself too down."

"Thanks Bob, I think I need to be alone for a bit."

How could this have happened? Bill has been athletic since he was a toddler. From the moment he learned how to crawl I knew Billy was going to be one those humans who would always be on the move. When Bill was three, and it was time for pruning, most of us here in the spinal cord stayed put. Only those neurons that are not used get pruned; it was no surprise that his creative neurons were taken away, but his analytical neurons were able to use that space. Oh, I should go ask Lucy how much longer she is going to be holding up.

"Lucy? Hey you look tired. Are you okay?"

"Oh Larry, I can feel myself getting weaker— I don't know what to do. Every time I try to accept your neurotransmissions it takes absolutely everything out of me to get action potential from the hillock and through my axon; the neurotransmitters simply don't have the same effect they use to."

"Hang in there Luc. I'm going to send you some neurotransmitter; Bill's about start his annual run for breast cancer. I think he said something about this being his last time, it truly is a shame."

For as long as I can remember, Bill has been running. He ran a little in middle school, but it became his passion when he tried out his freshman year of high school. Bill was the star track runner. For some odd reason, the programmed development of the neurons in the prefrontal cortex was halted that year. So, he could never remember to bring his homework from home, his folders were always scattered, the kid just couldn't get his head right until the prefrontal cortex finally began its pruning almost a year later.

"Everyone go into resting mode, everyone go into resting mode! Billy has just fallen! I repeat Billy has just fallen!"

"Oh my DNA, I better go check on Lucy!"

"Lucy! Lucy!"

"I'm sorry Larry...I have to call it quits...most of us motor neurons have to..."

"Don't talk like that Lucy"

"It's been almost two years since Bill went to the doctor to confirm that he had ALS. It's time Larry; it's hard for all us. And...and we have gotten too weak."

"If you and the other motor neurons give up Lucy, me and the other interneurons will have nothing left to do. My DNA is going to have me deteriorate just the same."

"I know that Larry. And I also know that if we all deteriorate Bill is going to go through paralysis and he is going to die."

"I guess there is only so much we can do for Bill."

"Sorry... (Boo-hoo) Larry."

"Oh Lucy, my dear Lucy, it's not your fault, don't cry...don't cry."

"Good bye Larry (Boo-hoo)."

"Good bye Lucy. Sorry Bill, I tried, good bye all."

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\*This author wrote the paper for FIYS 106: Medical Mysteries taught by Dr. Shubhik DebBurman.