The Ages of a Neuron: My Tribulations

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Where am I? How did I get here? There is so much I don't remember. All I know now are the slow waves of nutrients that barely keep me alive. I fear my host is dying, and I wonder if I could have helped prevent this…

I am a neuron. This is the chronicle of my 93-year life and of my tragic death. I am one of the 100 billion neurons in the brain of Ronald Reagan, the 40th president of the United States. I am proud of the achievements I have helped Ronald make. However, there is one thing I wish I had not done.

My purpose is to aid my host. I am his advisor, and I have influenced many of his actions. At Ronald's birth in Illinois, our potential was unlimited. Just like me during my first moments, Ronald had the same potential as all other infants his age and could have become anything. Over the years, he would develop an interest in acting and helping people, and he wanted to spend his life doing this. However, Ronald faced opposition. Many people around him wanted him to pursue something more intellectual, such as economics, and constantly pushed him to take up an intellectual career[A]. And yet, Ronald persisted in trying to follow his dreams.

After Ronald's long and successful career as an actor, he decided to pursue something else. He made a migration[B] toward a career that would allow him to help more people, just as I migrated in the neural tube when Ronald was an embryo. This was a harrowing journey, and it forever changed the type of neuron I would become. Eventually, Ronald decided to become a politician, and I ended up as an upper motor neuron, or Betz cell, in the primary motor cortex. With the help of his friends[C] who worked with him to develop connections[D], Ronald became the governor of California. However, he had to fight and compete[E] with many adversaries during and after his governorship.

After Ronald's migration to politics, the number of his connections continued to grow[F], as did my neural connections. We both figured out which connections were good and which would destroy us. The good connections aided Ronald, enabling his successful election to the office of the President of the United States. He had many advisors[G] who informed him of matters across the world. At first, he didn't know what to do with this information, but Ronald was soon sending commands to his cabinet and making decisions that would affect the whole nation. Similarly, I sent out commands (in the form of action potentials) to Ronald's muscles. Much of the U.S. was pleased with his presidency, but there were always some people, both politicians and voters, that vehemently opposed him.

Those that opposed Ronald's presidency tried to stop the legislation in Congress that he was pushing. They degraded him and his work, and at one point, tried to kill him. However, they ultimately failed, as Ronald had an extremely successful presidency. The more extreme enemies, who refused to connect in any way to him, lost many of their own connections, suffering as a result[H]. This is, in a sense, close to the experience of many neurons during the host's teenage years, where unused and bad connections are pruned.

After Ronald's career as president was over, he retired from politics. He continued to speak publicly about certain issues, although his enemies persisted in degrading him. Yet another tried to harm him and was again unsuccessful. Eventually, one of his opponents became president of the U.S., taking over the powerful position he once held. These opponents made Ronald psychologically weak. I know he does not regret his career and its consequences, but at the time he had no idea what was in store for him over the next few years.

Near the end of Ronald's life, he became weaker than ever before. He started to have trouble doing basic activities, such as walking and talking. No doubt the stress his enemies put on him was a contributing factor[I]. Ronald tried to fight back, but this only exacerbated his situation, making him even weaker. Eventually, his doctors diagnosed him with Alzheimer's disease, an incurable neurodegenerative disease that starts showing symptoms later in life. Alzheimer's disease is caused by an excess of the Tau and Beta-amyloid proteins in the brain, which form tangles and plaques, destroying the brain's ability to function. The brain's immune system will try to fight but will kill neurons in the process. There was truly no escape from this mental prison.

At this point, I knew there had to be something I could do to stop this atrocity.

Because my role is similar to that of an advisor, I take in information and bring it to Ronald. Like many other neurons in the brain, I have some level of control over Ronald's actions. I decided to take matters into my own foot-long axon and worked to keep him strong. I encouraged other neurons to do the same, and they worked with me. At first, I felt relieved. In some microscopic way, I was slowing the death of my beloved host. However, this feeling quickly died away.

Now, I am overwhelmed. I have spent so long keeping Ronald strong, and defending him against his enemies. This has made me weak. Ronald's enemies are much stronger than he is and will persist until they succeed in destroying the work he tried so hard to accomplish. I am finding it harder and harder to talk with other neurons, and I am becoming lonely.

Regrettably, if I hadn't decided to keep Ronald strong, I would be able to function properly. I would at least be able to do my job and could die with dignity. I wish I had kept myself strong. Does this make me selfish? I think so.

I am alone. I am finding it harder to focus on my job, and I can barely keep myself alive, let alone keep Ronald alive. Sometimes I forget what I am supposed to do, and I am increasingly forgetting what I am. I am becoming confused, like my host, and often send out the wrong commands. I am alone. My job is getting more difficult…

Who am I? I know I am a neuron, but I forget what kind. I know I tried to help my host, but since I feel so horrible, I must have failed. I think my perception of time is changing, but since I remember so little it is hard to tell. It feels like every breath, every pulse of refreshing oxygen my host gives me is getting more labored, more weak. Soon, I fear I will die of starvation[J], just like my host.

The last breath has been taken. I can't feel oxygen coming to nourish me, and am at the end of my life. The constant pulse of my surroundings has disappeared, and I fear my host has died. I don't know who I am or who my host is. Whoever we are, I hope we did something great.

I am no more.

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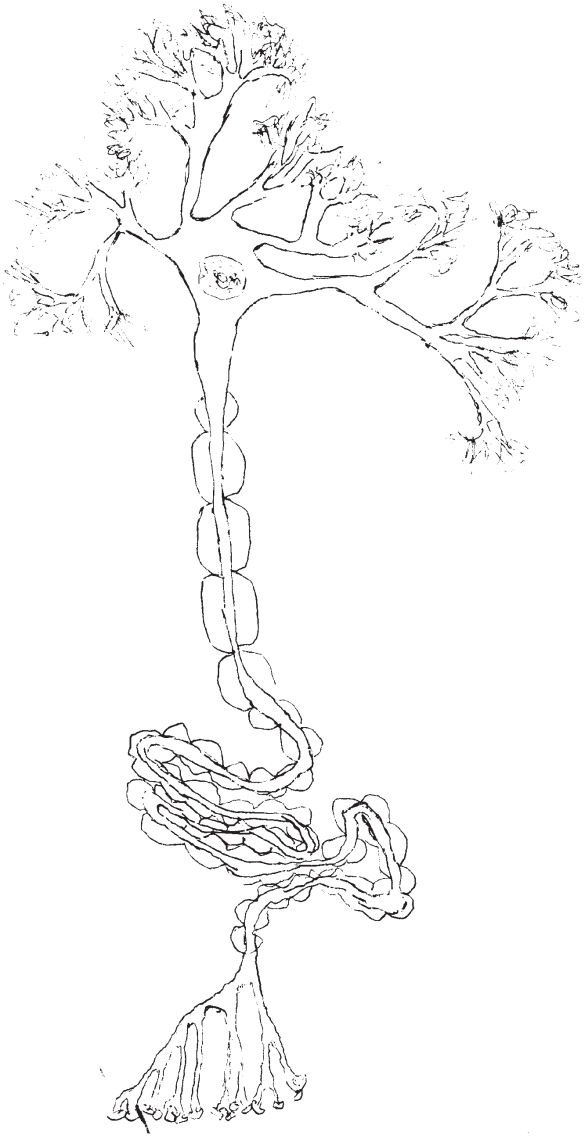
The dendrites, cell body, and part of the axon of a Betz cell



The support provided (radial glia and Ronald's contacts) during a neuron's migration

[A]Ronald's enemies represent the stresses on his brain. Most of his enemies represent the Beta-amyloid plaques and Tau tangles of Alzheimer's disease. At first, they are weak, and do not effect the brain much.

[B]Ronald's career migration represents the actual migration of the neuron. The neuron starts deep in the brain with all the other un-differentiated cells. It crawls up the radial glia (advisors and allies), going to the layer it will spend the rest of its life in.

[C]Ronald's friends represent the neurotrophic and tropic factors that nourished and guided (respectively) the neuron to its resting place.

[D]These connections represent the growth and development of the neuron's dendrites and axons.

[E]Neurons in the baby's brain have to compete for resources and space.

[F]Neurons in the brain have to work out which of their connections are beneficial, and eliminate those that are not.

[G]These advisors represent the neurons in contact with the (main character) neuron's dendrites. They send information to the neuron, which decides what to do with it, before sending it out as commands. This is characteristic of a Betz neuron in the primary motor cortex, such as the main character neuron.

[H]This represents the paring back of useless neural connections in the teenage brain. The enemies in this case are the neurons whose bad connections are being destroyed.

[I]This stress represents the effect of Beta-amyloid plaques and Tau tangles on the brain. Although both proteins were present for Ronald's whole life, they are only now starting to bind together and tangle up, damaging the cells that produced them in the first place. The host's immune cells will try to stop the plaques, but destroy neurons in the process.

[J]At this point in Alzheimer's disease, neurons were constantly being destroyed. In Ronald's case, a pneumonia infection was making it difficult for him to breathe, cutting off the vital nutrients he and the neuron needed to survive. Because a lack of nutrients and general neural degradation can cause an individual to become confused, the main character neuron had trouble remembering what it was, and what it was supposed to be doing. This lack of nutrients would eventually kill both Ronald and the neuron. Ronald died first, and the lack of blood supply destroyed what was left of his brain.